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Stanislaw Gallo

GALLO'S BAND BOOK

PART I

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GALLO'S BAND BOOK

A TREATISE ON WIND INSTRUMENTS,
SYMPHONY BAND AND MILITARY BAND

By
STANISLAO GALLO

*Conductor of the Gallo Symphony Band
and
Head Instructor of the School for Bandmasters and Players
at the
New England Conservatory of Music, Boston*

PART I WIND INSTRUMENTS

THEIR TECHNIQUE, NOTATION, TONE-COLOR,
AND USE IN BAND AND ORCHESTRA

Second Edition, Revised and Enlarged

The Boston Music Company.
Boston, Mass.

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In preparation

Part II

BAND INSTRUMENTATION

Including a practical band reform; the systematic application of the Standard Score to Symphony Bands and Military Bands of all sizes; and a progressive course in sectional scoring.

Part III

EXAMPLES IN FULL SCORE

With important suggestions regarding the execution:—conducting; open-air concert platform and seating of performers; marching formation of the Military Band; etc.

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PREFACE

There has been no stinting in research and experiment, in order to make this book as clear, complete and brief as possible. What others have written on this subject, has been duly considered and compounded; the best masters on each instrument have been consulted; makers of new and modernized devices have lent their counsel; renowned composers and conductors have declared their adherence to whatever novel principles and conceptions are here set forth. The book constitutes the result of years of patient and systematic application, offered now to students and musicians in practical and concise form.

Only those familiar with the complexity of the subject, will, at a first glance, appreciate the enormous help and saving of time which may be gained by the study, in Part I, of the tables and expositions which present all the possibilities of all the wind instruments; point to their analogy and differences; and teach their fittest and surest use. What would ordinarily occupy hundreds of pages of involved explanations, has thus been set down into condensed and synoptic charts.

Parts II and III form a comprehensive guide to band instrumentation. The various combinations of wind instruments, each of which is a homogeneous unit, are therein presented as mere modifications of the Symphony Band, and are treated with the aid of one and the same score. The Symphony Band score, which in the structure, i.e. number and disposition of parts, corresponds to the Symphony Orchestra score, simplifies greatly the work of transcribing any symphonic composition from orchestra to band, and, moreover, affords the composer the possibility of writing for band without the necessity of prior study, as he may transfer his conception from the plan of the orchestra directly to that of the band.

What is most valuable to the instrumentator for daily references, such as information concerning the compass, notation and transposition of the various instruments used in the band score, or of those found in works to be arranged for band, is presented in the Introduction to Part I. Additional data, concerning band instruments in sundry, special combinations, like the Fanfare, Bugle Corps, Drum-and-Fife Corps, etc., will be found in an Appendix following Part III.

Everything has been made subservient to the needs of simplifying and condensing the material essential to the bandmaster, the composer or instrumentator. Each part or volume, complete in itself, is a practical and reliable handbook. Nor is their applicability limited to what concerns only the band, but the whole work should prove equally valuable to any one desirous of studying the wind instruments in connection with symphonic or operatic orchestras.

It is hoped that thereby the standard band repertoire will be developed and that a greater number of composers will be drawn to write more serious and artistic music for such combinations, the actual resources of which have been barely tapped. As the only satisfactory purveyor of musical entertainment in the open air, the Symphony Band is the logical means by which to bring good music to large masses and to further the musical education of the people.

STANISLAO GALLO.

Boston, Mass.,
January, 1921.

PRELIMINARY REMARKS

In order to simplify the explanations in the text, it has been found necessary to adopt some terms for which there are no equivalents in the musical vocabulary. These adopted terms and their respective definitions are as follows:—

Conic-wood (page 34): the section of keyed instruments having a conical tube; comprising all the instruments generally known as “wood-wind,” with the sole exception of the Clarinets, which have a cylindrical tube. (See explanatory foot-note, regarding the cylindrical Flute, page 38.)

Grand Quintet (page 35): the five principal parts in the band- or orchestral-score, which are performed in mass (redoubled)—by Clarinets, in the Symphony Band and, by Strings, in the Symphony Orchestra.

Instrumentator (page 42): the composer or “arranger” who scores for band or orchestra an original composition of his own, or makes a transcription, adaptation or arrangement of an instrumental composition for a combination of instruments different from the original.

Other adopted terms are duly explained in the text itself or in foot-notes.

The term *band* (appearing in the text in small letters) applies in a general way to any combination of wood-wind, brass and percussion instruments. Likewise the term *orchestra* signifies any combination of string, wood-wind, brass and percussion instruments.

When a distinct form of band or orchestra is to be defined, a specific compound name is then employed, viz.: *Symphony Band* (see page 31), *Military Band*, *Brass Band*, etc.; *Symphony Orchestra*, *Vaudeville Orchestra*, *Dance Orchestra*, etc. (appearing in the text with capital initials).

The term *Symphony Orchestra* (page 31) applies to both the orchestra of the concert-hall and that of the grand opera—both having the same instrumentation, excepting the association of the Voices with the latter.

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INTRODUCTION

SOUND-PRODUCING INSTRUMENTS IN GENERAL

The synoptical-tables given in this Introduction will furnish a comprehensive idea of the nature and compass of all the sound-producing instruments now used, including some which are no longer in common use.

The various groups of the entire sounding mass are classified in the following order:—

I. THE HUMAN VOICE

- (a) Female
- (b) Children
- (c) Male

II. WIND INSTRUMENTS

- (a) Keyed-Cylindrical Tube
- (b) Keyed-Conical Tube
- (c) 3-Valve, Long Conical Tube
- (d) 3-Valve, Short Conical Tube
- (e) { 3-Valve, one-third Cylindrical and two-thirds Conical Tube.
4-Valve, one-third Cylindrical and two-thirds Conical Tube.
- (f) { 3-Valve, two-thirds Cylindrical and one-third Conical Tube.
4-Valve, two-thirds Cylindrical and one-third Conical Tube.
Slide, two-thirds Cylindrical and one-third Conical Tube.

III. POLYPHONIC WIND INSTRUMENTS

- (a) Without keyboard or stops
- (b) With keys and without stops
- (c) With a keyboard and stops
- (d) With three or four manuals (keyboards), pedal and stops

IV. PERCUSSION INSTRUMENTS

- (a) Indeterminate pitch
- (b) Changeable pitch
- (c) Fixed pitch

V. STRINGED INSTRUMENTS


- (a) Plucked
- (b) Percussive
- (c) Bowed


The inclusion, in this Introduction, of instruments not employed in the band, is intended to give the student all the information needed in connection with band scoring:—


To become thoroughly efficient in this branch of music, one must be familiar not only with the instruments of the band, but also with those employed in other branches of instrumental music (such as the orchestral instruments, the Piano, the Organ, etc.) from which, part of the band repertoire is generally transcribed.

The classification, which in itself provides a clear idea of the nature, character, compass and notation of each instrument, and the brief explanations on the Organ, Harp, bowed instruments, etc. will enable the student to understand the constructive parts of the different forms of instrumental music. He will then learn more easily as regards their employment and execution, by diligent score reading—at first simply analyzing and then following the performances of such music in the concert-hall or the opera house.


EXPLANATORY NOTE


In the following tables the two whole notes () indicate the limit of the tonal compass.

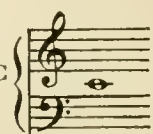
The eighth-notes () indicate the extreme tones obtainable only by a few skilled performers, and, therefore, are to be avoided in orchestral, band or vocal parts.

The stemless note-heads () indicate the tones which are lacking entirely in some instruments.

The notation of the transposing instruments is indicated on the right-hand side of the tables under the heading "Transposition," and denotes as follows:—

Reading-Transposition:—The first breve () indicates the *written-C*, and the second, the *actual sound* of the written-C, bearing the signature of the key which results when the instrument plays without accidentals.

Writing-Transposition:—The square note-head () represents the tone of the transposing instru-

ment corresponding to middle-C  bearing

the signature of the instrument corresponding to the actual key of C-major or A-minor.

In several instruments of either extremely high or low register, where the tonal-compass does not contain middle-C, the square note is then enclosed within brackets to indicate that *such would be* the note that would correspond to middle-C, were that note included in the compass of the instrument.

The instruments which are most in use are designated by capitals; those rarely used, by italics, and those which are obsolete, by italics within brackets.

I The Human Voice

(a) FEMALE

[illegible]

(b) CHILDREN

1st SOPRANOS

2nd SOPRANOS

ALTOS

The image shows the first three staves of a musical score. The first staff is for the 1st Sopranos, the second for the 2nd Sopranos, and the third for the Altos. Each staff begins with a treble clef and a key signature of one sharp (F#). The music consists of a series of eighth and sixteenth notes, followed by a dotted half note, and then a final note. The notes are written in a simple, clear font, and the staves are separated by a small gap.

(c) MALE

Principals
(or Soloists)

TENOR

BARITONE

1st BASS
(or Basso Cantante)

2nd BASS
(or Basso Profondo)

Chorus

1st TENORS

2nd TENORS

1st BASSES

2nd BASSES

The musical score is written on eight staves. The top four staves are for the Principals/Soloists: Tenor (treble clef), Baritone (bass clef), 1st Bass (bass clef), and 2nd Bass (bass clef). The bottom four staves are for the Chorus: 1st Tenors (treble clef), 2nd Tenors (treble clef), 1st Basses (bass clef), and 2nd Basses (bass clef). Each staff begins with a key signature of one flat (B-flat) and a common time signature (C). The music consists of a series of notes and rests, with some notes connected by slurs or dotted lines, indicating a melodic progression across the measures.

Transposition

written C

sound

middle C

II Wind Instruments

Transposition

(a) Keyed-Cylindrical Tubes

Single-reed mouthpiece

*Sopranino Clarinet in Ab**Sopranino Clarinet in F*SOPRANINO CLARINET in Eb
figure 1, page 51*Sopranino Clarinet in D*
figure 1, page 51*Soprano Clarinet in C*SOPRANO CLARINET in Bb
figure 2, page 51SOPRANO CLARINET in A
figure 2, page 51*Alto Clarinet in F*
(Bassett-horn)ALTO CLARINET in Eb
figure 3, page 51

| | written C | sound | middle C |
|---|-----------|-------|----------|
| <i>Sopranino Clarinet in Ab</i> | | | |
| <i>Sopranino Clarinet in F</i> | | | |
| SOPRANINO CLARINET in Eb figure 1, page 51 | | | |
| <i>Sopranino Clarinet in D</i> figure 1, page 51 | | | |
| <i>Soprano Clarinet in C</i> | | | |
| SOPRANO CLARINET in Bb figure 2, page 51 | | | |
| SOPRANO CLARINET in A figure 2, page 51 | | | |
| <i>Alto Clarinet in F</i> (Bassett-horn) | | | |
| ALTO CLARINET in Eb figure 3, page 51 | | | |

Transposition

Single-reed mouthpiece

Treble-clef notation

BASS CLARINET in C
figure 4, page 51

Bass-clef notation

Treble-clef notation

BASS CLARINET in B \flat
figure 4, page 51

Bass-clef notation

Treble-clef notation

Bass Clarinet in A
figure 4, page 51

Bass-clef notation

Treble-clef notation

Contrabass Clarinet in F

Bass-clef notation

Treble-clef notation

Contrabass Clarinet in E \flat

Bass-clef notation

Actual-sound notation

CONTRABASS CLARINET in C
figure 5, page 51

Octave notation

1st Transposing notation

CONTRABASS CLARINET in B \flat
figure 5, page 51

2nd Transposing notation

The musical score is organized into a grid with seven rows of notation. Each row contains a staff with a treble clef and a staff with a bass clef. The notation includes various musical symbols such as notes, rests, and accidentals. The score is divided into three main sections by vertical dashed lines. The first section is labeled 'written C' and the second is labeled 'sound'. The third section is labeled 'middle C'. The notation is written in a style that is common in musical scores for keyed-cylindrical tubes, with a focus on transposition and octave notation.

(b) Keyed-Conical Tube

| | | Transposition | | |
|---|---|---------------|-------|----------|
| | | written C | sound | middle C |
| Beak mouthpiece | (1) <i>[Flageolet]</i> | | | |
| | (2) <i>Ocarina</i> | | | |
| Lateral-hole mouthpiece | PICCOLO in D \flat figure 6, page 59 | | | |
| | PICCOLO in C figure 6, page 59 | | | |
| | <i>[Small Flute in E\flat]</i> | | | |
| | <i>Flute in D\flat</i> figure 7, page 59 | | | |
| | FLUTE in C figure 7, page 59 | | | |
| | <i>Alto Flute in G</i> also called "Bass-flute" figure 8, page 59 | | | |
| | (3) <i>Bass Flute in C</i> | | | |
| | (4) Piccolo Fife in E \flat also called in "F" | | | |
| | (4) Fife in A \flat also called in "B \flat " | | | |
| (4) Fife in E \flat also called in "F" | | | | |

(1) The Flageolet is employed in Handel's "Acis and Galatea," Gluck's "Die Pilgrim von Mekka," Mozart's "Il Serraglio" and few other works.

(2) The Ocarina may be appropriately employed as a "Cuckoo-instrument." Other sizes of Ocarinas are also found, tuned higher or lower than the one above.

(3) A new instrument, recently invented by A. Albisi (Flutist of "La Scala," Milan), which has proved very satisfactory.

(4) The Fifes (Flutes with six holes and without keys) can produce only the *written* diatonic scales in D-major and G-major. These instruments are commonly called by the actual key-note given by their written D; thus the first and third Fifes in E \flat are called "in F," and the second in A \flat is called "in B \flat ."

Single-reed mouthpiece

| | | Transposition | | |
|--|--|---------------|-------|----------|
| | | written C | sound | middle C |
| [Sopranino Saxophone in F] | | | | |
| [Sopranino Saxophone in Eb] | | | | |
| Soprano Saxophone in C | | | | |
| SOPRANO SAXOPHONE in Bb figure 9, page 59 | | | | |
| Alto Saxophone in F | | | | |
| ALTO SAXOPHONE in Eb figure 10, page 59 | | | | |
| Tenor Saxophone in C | | | | |
| TENOR SAXOPHONE in Bb figure 11, page 59 | | | | |
| Baritone Saxophone in F | | | | |
| BARITONE SAXOPHONE in Eb figure 12, page 59 | | | | |
| Bass Saxophone in C | | | | |
| Bass Saxophone in Bb | | | | |

Keyed-Conical Tube (Continued)

| | | Transposition | | |
|---|--|---------------|-------|----------|
| | | written C | sound | middle C |
| OBOE figure 13, page 60 | | | | |
| Oboe d'Amore (Mezzo-Soprano Oboe in A) | | | | |
| ENGLISH HORN (Alto Oboe in F) figure 14, page 60 | | | | |
| Baritone Oboe (also called "Heckelphone") | | | | |
| [Fagottino] (Small Bassoon in G) | | | | |
| BASSOON figure 15, page 60 | | | | |
| CONTRABASSOON figure 16, page 60 | | | | |
| [Sopranino Sarrusophone in Eb] | | | | |
| [Soprano Sarrusophone in Bb] | | | | |
| [Alto Sarrusophone in Eb] | | | | |
| [Tenor Sarrusophone in Bb] | | | | |
| Baritone Sarrusophone in Eb | | | | |
| Bass Sarrusophone in Bb | | | | |
| BASS SARRUSOPHONE in C or simply "Sarrusophone" figure 17, page 60 | | | | |
| CONTRABASS SARRUSOPHONE in C or simply "Contra-Sarrusophone" figure 18, page 60 | | | | |

(1) Wagner made use of the actual-sound notation in "Parsifal!"

| | | Transposition | | |
|-------------------|---------------------------------------|------------------|-------|-----------------|
| | | written <i>C</i> | sound | middle <i>C</i> |
| Cup mouthpiece | [Sopranino Bugle in <i>E♭</i>] | | | |
| | [Soprano Bugle in <i>B♭</i>] | | | |
| | [Soprano Bugle in <i>A</i>] | | | |
| | [Alto Ophicleide in <i>F</i>] | | | |
| | [Alto Ophicleide in <i>E♭</i>] | | | |
| | [Bass Ophicleide in <i>C</i>] | | | |
| | [Bass Ophicleide in <i>B♭</i>] | | | |
| | [Contrabass Ophicleide in <i>F</i>] | | | |
| | [Contrabass Ophicleide in <i>E♭</i>] | | | |
| | [Serpent] | | | |
| [Russian Bassoon] | | | | |

Note. The obsolete instruments contained in the above table, are the precursors of the modern valve instruments. Their parts, still found in old orchestral and band scores, are now given to Saxhorns or Tubas, which, in intonation and tonal-quality, are far superior to their archaic relatives.

(c) Three-valve: Long Conical Tube

Transposition

Deep conic-cup mouthpiece

| | written <i>C</i> | sound | middle <i>C</i> |
|---|------------------|-------|-----------------|
| [Horn in <i>C</i> -alto] | | | |
| [Horn in <i>Bb</i> -alto] | | | |
| [Horn in <i>A</i>] | | | |
| [Horn in <i>Ab</i>] | | | |
| [Horn in <i>G</i>] | | | |
| (1) (2) (3) HORN in <i>F</i> figure 19, page 76 | | | |
| (3) Horn in <i>E</i> | | | |
| (3) HORN in <i>Eb</i> figure 19, page 76 | | | |
| [Horn in <i>D</i>] | | | |
| [Horn in <i>C</i> -basso] | | | |
| [Horn in <i>Bb</i> -basso] | | | |

Note. The obsolete instruments — included in this section to simplify the classification — were in reality natural-horns (without valves), not possessing the chromatic scale, but only the first harmonic series. (See page 37)

(1) Also called "French Horn"

(2) At the present time, an instrument called the "Double-horn" is largely used by Horn-players. It is a Horn in *F* with an extra set of Tubes, controlled by a special valve; when this valve is pressed by the player's thumb, the intonation-key of the instrument is changed from *F* to *B*-flat Alto, thus enabling the performer to play high passages with greater ease of execution.

(3) In former years, the Bass-clef notes of the Horns were written an octave lower than the above correct modern notation.

(d) Three-valve: Short Conical Tube

| | | Transposition | | |
|--|--|---------------|-------|----------|
| | | written C | sound | middle C |
| Bell-cup mouthpiece | <i>Sopranino Saxhorn in E\flat</i> (The conical bore E \flat Cornet) figure 20, page 76 | | | |
| | SOPRANO SAXHORN in B \flat (The conical bore B \flat Cornet) figures 21 and 22, page 76 | | | |
| | MEZZO-SOPRANO SAXHORN in B \flat (The Flugelhorn or valve Bugle) figure 23, page 76 | | | |
| | [Alto Saxhorn in F] | | | |
| | ALTO SAXHORN in E \flat figure 24, page 76 | | | |
| | TENOR SAXHORN in B \flat figure 25, page 77 | | | |
| | BARITONE SAXHORN in B \flat figure 26, page 77 | | | |
| | Modern, actual-sound notation | | | |
| | Bass Saxhorn in F | | | |
| | French, transposing notation | | | |
| Modern, actual-sound notation | | | | |
| BASS SAXHORN in E \flat figures 27 & 29, p. 77 & 78 | | | | |
| French, transposing notation | | | | |
| Modern, actual-sound notation | | | | |
| Contrabass Saxhorn in C | | | | |
| French, octave notation | | | | |
| Modern, actual-sound notation | | | | |
| CONTRABASS SAXHORN in B \flat figures 28 & 30, p. 77 & 78 | | | | |
| French, transposing notation | | | | |

(e) Three-valve: one-third Cylindrical
and two-thirds Conical Tube

CORNET in B \flat
(The "Cornet-à-pistons" in B \flat)

CORNET in A
(The "Cornet-à-pistons" in A)

Four-valve: one-third Cylindrical and two-thirds Conical Tube

Alto Tuba in E \flat
figure 31, page 79

Tenor Tuba in B \flat
figure 32, page 79

BARITONE TUBA in B \flat
abbreviated "B \flat -Tuba" (The Euphonium)
figure 33, page 79

Bass Tuba in F
abbreviated "F-Tuba"
figure 34, page 79

BASS TUBA in E \flat
abbreviated "E \flat -Tuba"
figure 34, page 79

Contrabass Tuba in C
abbreviated "CC-Tuba"
figure 35, page 79

CONTRABASS TUBA in B \flat
abbreviated "BB \flat -Tuba"
figure 35, page 79

Deep bowl-cup mouthpiece

Compass and transposition of the
"TUBEN" used by Richard Wagner

(1)

1st notation Tenor Tuba in B (B \flat)

Bass Tuba in F

2nd notation Tenor Tuba in E (E \flat)

Bass Tuba in B (B \flat)

Transposition

written C

sound

middle C

(1) See foot-note No. 4, page 62

(f) Three-valve: ⁽¹⁾two-thirds Cylindrical
and one-third Conical Tube

Transposition

21

Shallow bowl-cup mouthpiece

| | written C | sound | middle C |
|---|-----------|-------|----------|
| Modern Trumpet in C | | | |
| Modern TRUMPET in B \flat figure 36, page 80 | | | |
| Modern TRUMPET in A figure 36, page 80 | | | |
| [Trumpet in G] | | | |
| Trumpet in F figure 37, page 80 | | | |
| [Trumpet in E] | | | |
| TRUMPET in E \flat figure 37, page 80 | | | |
| [Trumpet in D] | | | |
| [Ancient Trumpet in C] | | | |
| [Ancient Trumpet in B] | | | |
| [Ancient Trumpet in B \flat] | | | |
| [Ancient Trumpet in A] | | | |
| [Bass Trumpet in E \flat] | | | |
| [Bass Trumpet in D] | | | |
| Bass Trumpet in C | | | |
| Bass Trumpet in B \flat ⁽²⁾ (same tubing as the Tenor Trombone) | | | |

(1) The obsolete instruments, included in this section to simplify the classification, were in reality Natural-Trumpets (without valves).

(2) See foot note No. 1, page 22

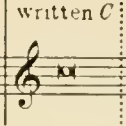
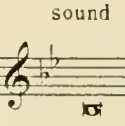
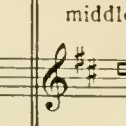
Four-valve: two-thirds Cylindrical and one-third Conical Tube


Treble-clef notation

Tenor (valve) Trombone in B \flat ⁽¹⁾
figure 38, page 80

actual sounds Bass-clef notation

Transposition


| written C | sound | middle C |
|--|---|---|
|  |  |  |



Bass (valve) Trombone in F



Contrabass (valve) Trombone in B \flat ⁽²⁾



Slide: two-thirds Cylindrical and one-third Conical Tube

[*Alto Trombone (in E \flat)*]



TENOR TROMBONE (in B \flat)
figure 39, page 80



Both the Tenor and Bass-cleff
are alternatively used

Bass Trombone in G



BASS TROMBONE (in B \flat and F)
(Large bore B \flat Trombone with F-valve)
figure 40, page 80



[*Contrabass Trombone in B \flat*
Employed by Wagner]

impracticable as a slide instrument

(1) The Tenor Valve Trombone in B \flat , the tubing of which corresponds in length and diameter to that of the Bass Trumpet in B \flat , is now generally employed in place of this instrument in Wagner's "Ring!" Tenor (valve) Trombones in C—one tone higher than the above instrument—are also made.

(2) Known in Italy as "*Trombone Basso-Verdi*" after Giuseppe Verdi, who first introduced it in "Otello" and then in "Falstaff"

(3) See explanatory note, page 70

III Polyphonic-Wind Instruments

(a) Without Keyboard or Stops

with pipes

Musetta or Melody

BAGPIPE

Drone-pipes

approximate compass

diatonic

Differently tuned, frequently in B-flat, F and E-flat.

(b) With Keys and without Stops

with free-reeds

ACCORDION
(or Concertina)

approximate compass

Compass and fingering system varying according to makers.

(c) With a Keyboard and Stops

| | | Written compass | pitch ⁽¹⁾ | effect |
|---|---|-----------------|----------------------|--------|
| Right-hand stops | <p>8' 16' 4' 8' celeste (pp) forte</p> <p>① ② ③ ④ C F or ⑤</p> <p>Flute Clarinet Piccolo Oboe</p> | | | |
| with free-reeds HARMONIUM Centre stops: | <p>expression grand jeu (all the stops)</p> <p>⑤ ⑥</p> | 4 | 8va higher | |
| | | 8' | actual sounds | |
| | | 16' | 8va lower | |
| Left-hand stops | <p>F or ⑤ forte</p> <p>⑥ soundine (pp)</p> <p>④ ③ ② ①</p> <p>Bassoon Clarinet Bourdon Cor anglais</p> | | | |

(1) The length in feet given in this table is equivalent to the pitch or length of the Organ pipes (See page 24)

(d) With three or four manuals (keyboards), pedal and stops.

| written compass | | pitch, or length of longest pipe | effect |
|---|--|-------------------------------------|----------------------------|
| With pipes Manuals ORGAN Pedal | | 2' | two 8 ^{ve} higher |
| | | 4' | 8 ^{va} higher |
| | | 8' | actual sounds |
| | | 16' | 8 ^{va} lower |
| | | 32' | two 8 ^{ve} lower |

Classification of Registers or Stops¹

Certain groups of stops, each composed of pipes similar in quality or construction, or both, are common to nearly all Organs in the United States; although instruments more recently built show radical departures in general tonal disposition from the older ones. The nomenclature of stops in this country, however, is a matter in which Organs of different builders often vary materially. A list of all the stops found in the instruments of a half-dozen of the most prominent builders would be unduly extended and confusing to the layman. The following table is intended to group only the principal stops (employing conventional American and English nomenclature), without regard to the special designations which may be given to any of them to indicate some nuance of color or quality.

The figures opposite each stop represent the "speaking length" in feet of its lowest pipe; or of the lowest of each series, where more than one series is indicated. Thus the name of a stop indicates approximately its quality, and may suggest its intensity; the number designates the pitch.

FOUNDATION STOPS (Flue)

| | <i>Large or Medium Scale (a)</i> | |
|--------------------|----------------------------------|-----------------------|
| | Manuals ² | Pedal |
| Diapason | 16', 8' | 32', 16', 8' (b) |
| Octave | 4' | 8', 4' (Super-octave) |
| Fifteenth | 2' | |
| Flute (c) | 8', 4' | 8', 4' (b) |
| Piccolo | 2' | |
| Bourdon (d) | 16', 8', 4' | 32', 16', 8', 4' |

Smaller Scale (String-toned)

| | Manuals | Pedal |
|-------------------------|---------|----------|
| Violone | | 32', 16' |
| Violoncello | | 8' |
| Gamba | 8' | |
| Salicional | 8' | |
| Dulciana | 16', 8' | 16' |
| Violin | 4' | |
| Voix Céleste (e) | 8' | |
| Unda Maris (e) | 8' | |

¹From information kindly furnished by Mr. Wallace Goodrich.

²Large Organs have three or four keyboards, called manuals, and designated *Choir* (lowest), *Great* (middle), and *Swell* (upper). If there be a fourth manual it is called *Solo*, and is placed above the Swell. The pipes of the Choir and Swell (and Solo) are usually enclosed in separate "swell-boxes," so-called, which are actually rooms inside the organ enclosed on all sides but the front; vertical shutters, operated by a pedal, may be opened or closed to effect corresponding variation in the intensity of the sound.

| MUTATION STOPS (Flue) (f) | | | Remarks |
|---------------------------|-------------------|--------------------|--|
| <i>Simple</i> | | | (a) By "scale" is meant the proportion of a pipe's diameter to its length. |
| | Manuals | Pedal | (b) Usually these so-called Diapasons in the Pedal are actually large scale wooden Flutes. |
| Quint | | 10 $\frac{2}{3}$ ' | (c) These stops exist in great variety, both as regards quality, intensity and nomenclature. |
| Twelfth | 2 $\frac{2}{3}$ ' | | (d) Stopped Flute pipes. Often called <i>Gedeckt</i> ; or improperly, although commonly, Stopped Diapason (if at 8' pitch). |
| <i>Compound</i> | | | (e) Vibrating stops; two ranks of pipes, each: one tuned slightly sharper than the other, but sounding simultaneously. |
| Mixture (g) | | | (f) Giving from one to six or more of the natural harmonics of the fundamental tone played; the fundamental tone being absent, unless provided by another stop. Simple mutation stops have one pipe for each note played; compound, two or more. |
| REEDS | | | (g) Pipes usually of modified Diapason quality, so voiced as not to produce harmonics of their own. Various named according to disposition of ranks. |
| | Manuals | Pedal | |
| Tuba or Trumpet | 16', 8' | 32', 16', 8' | |
| Clarion | 4' | 4' | |
| Bassoon | | 16' | |
| Oboe | 8' | | |
| Clarinet | 8' | | |
| Vox Humana | 8' | | |

IV

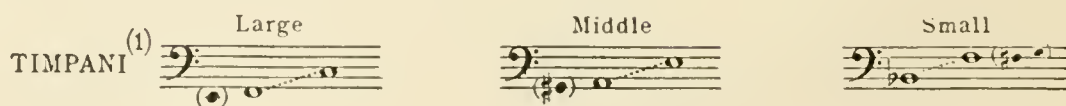
Percussion Instruments

(a) Indeterminate Pitch

| | | |
|-------------------------|---|---|
| With membrane..... | { | SIDE DRUM |
| | | <i>Rullante or Tenor-drum</i> |
| | | BASS DRUM |
| | | TAMBOURINE |
| | | <i>Tabor</i> |
| Of metal..... | | <i>Indian-drum</i> |
| | | <i>Chinese-drum</i> |
| | { | TRIANGLE |
| | | CYMBALS |
| Of wood..... | | TAM-TAM or GONG |
| | | <i>Sleigh-bells</i> |
| | { | CASTANETS |
| Special construction... | | <i>Rattle</i> |
| | | <i>Whip- or Slap-stick</i> |
| | { | <i>Wind-, Water-, and Crash-machine</i> |
| | | <i>Other noise-imitations</i> |

Note.—The rhythmical notation of all these instruments is written on the ordinary staff, or (in score) on a single line, with the conventional treble- or bass-clef.

(b) Changeable Pitch—with membrane



(1) Generally, in band, only two Timpani are used: the Large and the Small.

(c) Fixed Pitch

| | | Transposition | | |
|---------------------------|---|------------------|-------|-----------------|
| | | written <i>C</i> | sound | middle <i>C</i> |
| With mallets of metal | <i>Ancient-cymbals</i> (made expressly in the required pitch) | | | |
| | <i>Chimes</i> (made expressly in the required pitch) | | | |
| | TUBULAR BELLS | | | |
| | <i>Japanese bells</i> | | | |
| | <i>Anvils</i> (made expressly in the required pitch, or indeterminate) | | | |
| of wood | BELLS or CARILLON (Mallets-Glockenspiel) | | | |
| | XYLOPHONE | | | |
| With keyboard of metal | <i>Bells or Carillon</i> (Keyed-Glockenspiel) | | | |
| | <i>Typophone or Dulcitone</i> ⁽¹⁾ (Steel-tuning-forks) | | | |
| | CELESTA (Steel bars with wooden resonators) | | | |
| | Keyed Harmonica (Glass-plates) | | | |

(1) Employed in d'Indy's "Chant de la Cloche."

V Stringed Instruments

(a) Plucked

MANDOLIN
and
Mandolin-Banjo

"Transposed" notation

Tenor-Mandola
and
Tenor-Banjo

"Non-transposed" octave-notation

MANDOLA
(also called Octave-Mandola)

"Transposed" notation

Mando-Cello
and
Cello-Banjo

"Non-transposed" two octave-notation

Bass-clef notation

Mando-Bass

Treble-clef notation

BANJO, Regular

GUITAR⁽¹⁾
and
Guitar-Banjo

Steel-Guitar⁽²⁾

Ukulele

Ballalaika

ZITHER

Melody-strings

Accompaniment

Transposition

written *C*

sound

middle *C*

The diagram illustrates the notation for various stringed instruments, categorized into plucked instruments (a) and other stringed instruments. It shows the relationship between the written notation, the actual sound, and the middle C transposition for each instrument.

MANDOLIN and Mandolin-Banjo: Shows the instrument's range and the "Transposed" notation (Tenor-Mandola and Tenor-Banjo) and "Non-transposed" octave-notation.

MANDOLA (also called Octave-Mandola): Shows the instrument's range and the "Transposed" notation (Mando-Cello and Cello-Banjo) and "Non-transposed" two octave-notation.

Bass-clef notation (Mando-Bass): Shows the instrument's range and the "Transposed" notation (Mando-Cello and Cello-Banjo) and "Non-transposed" two octave-notation.

Treble-clef notation: Shows the instrument's range and the "Transposed" notation (Mando-Cello and Cello-Banjo) and "Non-transposed" two octave-notation.

BANJO, Regular: Shows the instrument's range and the "Transposed" notation (Mando-Cello and Cello-Banjo) and "Non-transposed" two octave-notation.

GUITAR⁽¹⁾ and Guitar-Banjo: Shows the instrument's range and the "Transposed" notation (Mando-Cello and Cello-Banjo) and "Non-transposed" two octave-notation.

Steel-Guitar⁽²⁾: Shows the instrument's range and the "Transposed" notation (Mando-Cello and Cello-Banjo) and "Non-transposed" two octave-notation.

Ukulele: Shows the instrument's range and the "Transposed" notation (Mando-Cello and Cello-Banjo) and "Non-transposed" two octave-notation.

Ballalaika: Shows the instrument's range and the "Transposed" notation (Mando-Cello and Cello-Banjo) and "Non-transposed" two octave-notation.

ZITHER: Shows the instrument's range and the "Transposed" notation (Mando-Cello and Cello-Banjo) and "Non-transposed" two octave-notation.

Melody-strings: Shows the instrument's range and the "Transposed" notation (Mando-Cello and Cello-Banjo) and "Non-transposed" two octave-notation.

Accompaniment: Shows the instrument's range and the "Transposed" notation (Mando-Cello and Cello-Banjo) and "Non-transposed" two octave-notation.

Transposition: Shows the relationship between the written notation, the actual sound, and the middle C transposition for each instrument.

Generally tuned a minor third above the written notation, like the Eb-Sopraninos. Also written in actual sounds: minor third higher.

Occasionally tuned one tone above or below the written notation, like the D-Sopraninos and Bb-Sopranos, respectively.

This is the usual tuning of the ordinary instrument. Other types of Ballalaikas are also found, which vary each other in their size, number of strings and notation.

The melody strings sound as written

(1) There are "Harp-Guitars," so called, with as many as ten *open* Bass-strings, from the E-flat downward, chromatically, in addition to the regular six strings.

(2) Played with a steel bar and three steel picks.

Plucked (Continued)

Irish-Harp
Single action thumb-lever

harmonics

Sometimes tuned in A-flat major

tuning of the strings

diatonic C-major or A^b major

Transposition

| written C | sound | middle C |
|-----------|-------|----------|
| | | |

The Irish-Harp produces the diatonic scale of C-major or A-flat major, according to the way it is tuned. With the single action every string—independently from its octaves—can be raised a half-tone

HARP
Double action with pedals

harmonics

tuning of the strings

diatonic C-flat major

Transposition

| written C | sound | middle C |
|-----------|-------|----------|
| | | |

The tuning of the strings of the Harp will produce the diatonic scale of C-flat major, and by the use of seven pedals at the base of the instrument, each pedal acting on all the strings (in octaves) of the same letter-name, all the notes of the compass can be raised a half-tone or a whole tone, thus enabling the player to tune the instrument in any desired key.

The *glissando*—which frequently occurs in Harp-music—is possible in every major, minor or altered scale; and by the use of homophones (enharmonic unisons) *glissandi* are also obtainable on *all* the chords of the diminished-seventh, and on some other four-note chords, as follows:—

| Diminished-7th, or rootless-minor 9th | Dominant-7th, or augmented 6th and 5th | Supertonic-7th in major, or subdominant 7th in minor | Supertonic-7th in minor or rootless-major 9th |
|---------------------------------------|--|--|---|
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

Chromatic-Harp

This instrument, recently invented by F Lyon, of Paris, is without pedals, having a string for each semi-tone throughout the entire compass. Very few, if any, of the modern harp-players have successfully mastered the new technique required for the playing of this instrument

Stringed Instruments (Continued)

(b) Percussive

(b) Percussive

with keyboard

PIANOFORTE

with 2 mallets

Hungarian Cembalo
(dulcimer or zimbalon)

(c) Bowed

Compass for general orchestral use

c) Bowed

VIOLIN

VIOLA

Viola d'Amore

Viola da gamba

VIOLONCELLO

CONTRABASS
(or Double-bass)

ordinary tones
(non-harmonic)

harmonics

strings

actual sounds

natural or artificial

all natural

not satisfactory

sounding octave lower

The image displays a musical score for bowed string instruments, organized into six staves. Each staff is divided into two main sections: 'ordinary tones (non-harmonic)' and 'harmonics'. The 'ordinary tones' section shows a sequence of notes (G, A, B, C, D, E, F, G) with a dotted line indicating the pitch contour. The 'harmonics' section shows a sequence of notes (G, A, B, C, D, E, F, G) with a dotted line indicating the pitch contour. The 'actual sounds' are shown as a series of notes (G, A, B, C, D, E, F, G) with a dotted line indicating the pitch contour. The 'natural or artificial' section shows a sequence of notes (G, A, B, C, D, E, F, G) with a dotted line indicating the pitch contour. The 'all natural' section shows a sequence of notes (G, A, B, C, D, E, F, G) with a dotted line indicating the pitch contour. The 'not satisfactory' section shows a sequence of notes (G, A, B, C, D, E, F, G) with a dotted line indicating the pitch contour. The 'sounding octave lower' section shows a sequence of notes (G, A, B, C, D, E, F, G) with a dotted line indicating the pitch contour.

Note: The ordinary tones (non-harmonic), the natural harmonics (played on an open string) and the artificial harmonics (played on a stopped string) form the Harmonic-series (see paragraph 2, page 37) of the bowed instruments, as follows:

Partial-tones

- | | | |
|-----|-----|--|
| 1st | — | The string vibrates throughout its whole length, producing the ordinary tones or fundamentals |
| 2nd | " " | vibrates into two equal sections by lightly touching the 8 ^{ve} which produces its unison, viz, the 8 ^{ve} of the fundamental. |
| 3rd | " " | " " three " " " " " " 5th " " " 8 ^{ve} , " " 12th " " " |
| 4th | " " | " " four " " " " " " " 4th " " " 12th, " " 15th " " " |
| 5th | " " | " " five " " " " " " " [major 3rd " " " 15th, " " 17th " " " |
| 6th | " " | " " six " " " " " " " [minor 3rd " " " 17th, " " 19th " " " |

The *natural harmonics* are generally written in actual sounds and indicated by this sign \circ above the notes.

The *artificial harmonics* used in orchestra parts, are formed exclusively of 4th partial-tones; — The string is stopped by the first finger and lightly touched by the fourth finger a perfect fourth apart, thus producing the 12th of the touched note, viz, the 15th of the stopped note. These harmonics are usually written in their finger-position with or without the resulting notes above, as follows:

effect () () ()

written     etc.

The Band Instruments

In addition to the foregoing brief description of all the instruments in general, a special table of the band instruments exclusively, will be given (pages 34 and 35). In this table the various groups are arranged in score order, and the compass characteristics of each instrument is more fully described by means of notational signs, thus providing the student with a complete and very useful chart to refer to when scoring for band.

The names of instruments are preceded by special symbols, the use of which serve to simplify the work on scoring exercises (see Parts II and III).

At the extreme right of the table, six of the best balanced wind-instrument units are given; i. e. the small, medium and large Symphony Band of twenty-five, fifty and seventy-five players, respectively, and the small, medium and large Military Band of twenty-two, thirty-five and fifty players, respectively.¹

The large SYMPHONY BAND of seventy-five players, is modeled after the Symphony Orchestra with elements which, acoustically, are the most suitable for outdoor performance. With this ensemble of instruments, and with competent players, modern works of the most intricate polyphonic structure can be given (on a properly built platform) outdoors, with a standard of artistic attainment equal to that of the Symphony Orchestra indoors.

The large MILITARY BAND of fifty players uses the same and practically all the parts of the Symphony Band, but with the Grand Quintet considerably changed in its proportions and instruments. This ensemble, designed for infantry bands, or similar organizations, attains the best possible

efficiency in the rendering of marching music, though it also possesses sufficient tonal-elasticity to render, to an adequate artistic degree, military program-music.

Changes or substitutions may be found necessary in the Military Band according to circumstances. For example: when a Military Band of fifty players is to be employed more for marching purposes than for concerts, its martial character may be increased by substituting the following four brass instruments:—

one Soprano Saxhorn (B \flat Cornet)
one Mezzo-soprano Saxhorn
one B-flat Tuba (Euphonium)
one E-flat Tuba

in place of:—

one Oboe (2nd)
one Sarrusophone (2nd)
one Bass Clarinet
one Contrabass Clarinet

If, on the other hand, the Military Band is to be employed mostly for concert work, or as an accompaniment for voices, it will be rendered more flexible by the introduction of three or four wood-wind instruments (including another Bass-Clarinet and the Contra-Sarrusophone) in place of three or four of the brass instruments.

Whenever any of the given instruments of the Military Band are lacking, substitution will then be made with other instruments that are the most suitable for the purpose.² For example:—

¹Other intermediate numerical proportions and larger combinations, up to ninety players, with the necessary information thereto, will be given in Part II.

²In all these substitutions the band parts remain the same, excepting the necessary transposition for the instruments tuned differently, as for instance the 3rd and 4th B-flat Clarinets from the Alto Clarinets, 5th lower; the B-flat Cornet or Trumpet, from the Alto Saxhorn, 5th lower; etc. (see Part II).

EXPLANATORY NOTE

In the following table, the compass given for the two lowest parts, **A₄** and **A₅**, are playable by both the instruments of the Symphony Band and those of the Military Band, excepting the high notes of the Bass Clarinets, *within parenthesis*, which are to be used only when the work is intended to be performed exclusively by the Symphony Band. The abbreviations: *Sy. B.* and *My. B.*, preceding the names of those instruments, signify that the two parts **A₄** and **A₅** are to be played, in the Symphony Band, by Bass

and Contrabass Clarinets and, in the Military Band, by B \flat -Tubas and E \flat - and BB \flat -Tubas respectively.

The low notes, *within parenthesis*, of the Alto Clarinets are to be avoided for the time being, as that part may be taken by Alto Saxophones or 3rd and 4th B-flat Clarinets, until the Alto Clarinets are more generally used.

For the explanation of the transposition columns, see Explanatory Note on page 10.

The Band Instruments

Their Score-order, Compass, Notation and Transposition

- o Best part of the compass
- p Difficult to attack softer than *mezzo-forte*
- f Weak and difficult to attack softer than *forte*
- ♯ Possible only for soloists: not in band parts
- Lacking in some instruments

| Section III Brass | Section II: Conic Wood | Section I Flutes & Piccolos | Transposition | | Well balanced proportions of | | | | | | | |
|----------------------|------------------------|-----------------------------|---------------|-------|------------------------------|----|----|-------------------|----|----|---|---|
| | | | written C | sound | Symph. Band of 25 | 50 | 75 | Milit. Band of 22 | 35 | 50 | | |
| F1 F2 F3 F4 | E1 E2 | B1 B2 B3 | FLUTE | | | | 1 | 2 | 3 | 1 | 2 | |
| G1 G2 | D4 | | PICCOLO | | | | | | | | | 2 |
| H1 H2 H3 | D2 | | OBOE | | | | | | | | | |
| H4 | D2 | | ENGL HORN | | | | 1 | 1 | 2 | | 1 | 2 |
| | D4 | | | | | | | | | | | |
| | D2 | | | | | | | | | | | |
| | D2 | | | | | | | | | | | |
| | D4 | | | | | | | | | | | |
| | E1 E2 | | | | | | | | | | | |
| | E3 | | | | | | | | | | | |
| | F1 F2 F3 F4 | | | | | | | | | | | |
| | G1 G2 | | | | | | | | | | | |
| | H1 H2 H3 | | | | | | | | | | | |
| | H4 | | | | | | | | | | | |

Section III: Brass, Continued

Section IV: Percussion, etc.

Section I: Grand Quire

| | | | | | | | | | |
|--------------|--|--|---|---|----|---|---|---|---|
| I1 { I2 } | SOPRANO SAXHORNS I II. (Conical Bore B♭ Cornets) | | 1 | 2 | 1 | 2 | 1 | 2 | 2 |
| I3 | MEZZO-SOPRANO SAXHORN | | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| I4 | ALTO SAXHORN | | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| I5 | TENOR SAXHORN | | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| I6 | BARITONE SAXHORN | | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| I7 | BASS SAXHORN (E♭) | | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| I8 | CONTRABASS SAXHORN (B♭) | | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| J1 | TIMPANI, etc. | | | | | | | | |
| J2 | SIDE DRUM, etc. | | | | | | | | |
| J3 | BASS DRUM, CYMBALS, etc. | | | | | | | | |
| K1 | Special Instruments | | | | | | | | |
| L1 | HARP (on two staves) | | | | | | | | |
| A1 { A2 } | SOPRANINO CLARINETS | | 1 | 1 | 2 | 1 | 1 | 1 | 1 |
| A1 { A2 } | SOPRANO CLARINETS I II. (on two staves) | | 4 | 6 | 10 | 2 | 2 | 4 | 6 |
| A3 | ALTO CLARINETS | | 2 | 4 | 8 | 2 | 2 | 4 | 4 |
| A4 | Sy. B.-BASS CLARINETS My. B.-B♭-Tubas (Euphonium) | | 2 | 4 | 6 | 1 | 1 | 2 | 2 |
| A5 | Sy. B.-CONTRABASS CLARINETS My. B.-E♭ & B♭-Tubas | | 2 | 4 | 6 | 1 | 1 | 1 | 2 |

(1) No line under symbol indicates inclusion of instrument in Small, Medium and Large combinations only (See Part II).
 (2) Double line under symbol indicates inclusion of instrument in Medium and Large combinations only (See Part II).
 (3) Single line under symbol indicates inclusion of instrument in Medium and Large combinations only (See Part II).

TO THE TEACHERS

The method of using this treatise—i.e. the order in which the various subjects should follow each other, the kind and number of illustrative examples to be given and the practising exercises to be assigned—should vary according to the musical ability (natural or acquired, or both) of the pupils.

Together with this, three auxiliary subjects should be associated—the necessary accomplishment for a musician in any branch of the Art—namely:

First:—Solfeggio, ear training and transposition, i.e., time beating and singing of the notes in actual sounds, in the treble- and bass-clef, at first, and then in the other five clefs (page 42), using the syllable-system: *Do, Re, Mi, Fa, Sol, La, Si*.

N.B.—Not the “movable-Do-system” taught in some public schools—which system, in the practice (playing or writing) is of no use whatsoever—but the French-Italian system in which C, D, E are always Do, Re, Mi, in whatever major or minor key those notes occur.

Second:—Elementary Piano playing for pupils who play other instruments; or, vice versa, *elementary playing of a wind instrument* if the pupil is a pianist.

Third:—Harmony and elementary counterpoint.

The pupils, thus, may be divided into two classes:

*Class A:—*Those who have already learned the above auxiliary subjects, and

*Class B:—*Those who merely play an instrument.

The courses for the pupils of Class A should be so divided:

*First course:—*Parts I and II combined (wind instruments and instrumentation).

*Second course:—*Part III and band conducting.

The courses for the pupils of Class B should proceed as follows:

*First course:—*Part I and primary study of the auxiliary subjects.

*Second course:—*Part II and advanced study of the auxiliary subjects.

*Third course:—*Part III and band conducting.

Each lesson on Wind Instruments and Instrumentation should consist of the study of a number of paragraphs covering one of the different points in the chapter, which point should be commented upon by the pupil orally, or with written examples, or exercises, similarly to those appearing throughout the text. For instance—in studying the first paragraphs in chapter I (see opposite page):—

- (1)—“Write the harmonic-series of an open-pipe 4 ft. 9 in. in length, which gives, as fundamental, first-space A, bass-clef.”
- (2)—“State the length of a stopped-pipe required for producing the same fundamental (first-space A, bass-clef).”
- (3)—“Play on the Piano the harmonic-series, up to the 10th partial tone, produced by a conical tube instrument which gives as fundamental, the second-line B \flat , bass-clef”—etc.

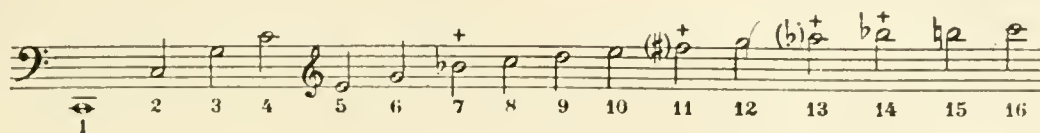
CHAPTER I

ACOUSTICAL PRINCIPLES OF THE WIND INSTRUMENTS

1. All the wind instruments are subject to the natural laws of the sound-producing pipes. By varying with the lip-pressure, the intensity of the blowing, the column of air in the tube, which in its entire length gives the fundamental, or first partial tone, may be divided into two, three, four, etc.,

vibrating sections, producing, respectively, the harmonics (or partial tones) Nos. 2, 3, 4, etc., thus forming the harmonic-series of the instrument.

2. The harmonic-series of an 8ft.-C open-pipe results as follows:



3. The harmonics Nos. 7, 11, 13 and 14, marked with +, according to our equal-temperament-scale, are not in tune, and therefore not used;—exception is made for the Horn and slide Trombone (see explanatory note, page 70).

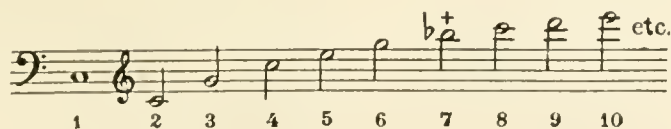
4. The longer and narrower the tubing of the instrument, the larger is the resulting harmonic series.

The cup-mouthpiece instruments, having, more or less, a very long and relatively narrow tube, can produce an extended harmonic series—the Horn reaching the 16th harmonic; whereas the keyed wind instruments—the tubes of which are comparatively short and large—rarely extend beyond

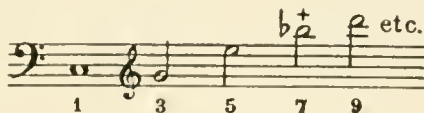
the 2nd and 3rd harmonics, thus the formation of their scale is based upon an entirely different principle.

5. The Clarinet, being cylindrically bored in its full length, from the joint of the mouth-piece to that of the bell, possesses the two characteristic properties of stopped-pipes. First, it produces the fundamental tone an octave lower than that produced by a conical instrument (or by an open-pipe) of the same length, and, second, it gives only the harmonics Nos. 1, 3, 5, etc.—skipping the harmonics of even numbers.¹ For example: the Soprano Clarinet in B♭ (see page 51) the length of which is

¹An open-pipe 4 ft. 4 in. (1.314 metres) in length gives a fundamental of 128 vibrations and *all* the harmonics in their successive order:



A stopped-pipe (or a *Soprano Clarinet in A♭*) 2 ft. 2 in. (0.657 metres) in length gives the same fundamental of 128 vibrations, and only the harmonics of uneven number.



Note:—For the explanation of this phenomenon see V. C. Mahillon's *Treatise on the Élément d'Acoustique*.

equal to that of the Oboe (see page 60), gives the scale of the 1st partial tones an octave lower than the latter instrument and it produces only the harmonics of uneven number; note the first *over-blow* of the Clarinet to the 3rd harmonic—skipping the 2nd, viz.: the over-blow to the 12th (see paragraph 21, page 44).

6. With the exception of the Clarinet, all the other wind instruments are more or less conical, either throughout their entire length of the tube, or in part of it, and for this reason they are subject to the same acoustical laws as the open-pipes, i. e., they give the same fundamental tone as an open-pipe of the same length, and produce *all* the partial-tones of the harmonic-series.

7. The conical wind instruments are divided into two different groups—viz.: keyed-conical instruments and cup-mouthpiece instruments—differing entirely from each other in the production of tone

and, especially, in the formation of the scale (see chapters IV and V). Thus the entire mass of wind instruments may be classified in three distinct groups, which are as follows:

Group I:—**Keyed-Cylindrical Tube Instruments**; working according to the acoustical principles of the **stopped-pipes**: single-reed mouthpiece:—**Clarinets**.

Group II:—**Keyed Conical Tube Instruments**; working according to the acoustical principles of the **open-pipes**; lateral-hole mouthpiece: Flutes¹; single reed mouthpiece: Saxophones; double-reed mouthpiece: Oboes, Bassoons and Sarrusophones. This group will be designated by the term **Conic-wood**.²

Group III:—**Valve- and Slide-Conical Tube Instruments**; working according to the acoustical principles of the **open-pipes**; cup-mouthpiece: Horns, Saxhorns, Tubas, Trumpets and Trombones, generally designated by the term **Brass**.¹

¹The Flute, by its lateral hole *embouchure* is in reality a pipe open on both ends. This explains why the instrument retains the properties of the open-pipe even when it is built with a cylindrical "body," as are most of the modern Flutes—with only the "head" slightly conical. However, to render the classification simpler, no distinction has been made between the Flutes and the reed-conical-tube instruments. The fact that *all* these keyed instruments overblow to the octave and give the same fundamental tone, with the same length of tube, will justify their being classed in the same group and treated together.

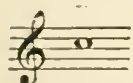
²The designations "wood" and "brass" must be considered only as conventional terms, for the material of which the wind instruments are made has *no effect whatever* on the *quality* of their tone. Many experiments, in this connection, have been made by various instrument makers, all resulting in the conclusion that it is only the column of air in the tube which produces the sound, and *not* the tube itself. We have, in fact, the *pure flute-tone* from whatever the instrument is made—either wood, silver or gold;—and the same may be said of the brass, nickel, or copper cup-mouthpiece instruments, and also the brass or wood Contra-Bassoon, Contrabass Clarinet, etc.

CHAPTER II

THE TRANSPOSING WIND INSTRUMENTS

Each family of wind instruments contains a certain number of instruments of the same nature, but of *different* intonation.

8. In order that the player may pass from one instrument to another of the same family, without changing the fingering, a uniform notation, called "transposing-notation" or "uniform fingering system," has been adopted, based on the notation for a "Soprano in C"—the typical instrument of the family—the reading and fingering of which is the same for the other instruments of different sizes. For example: the C in the third space, treble-clef



of the Soprano in C is also, in the reading and fingering, the *same note* for the other instruments of the family, but it sounds either higher or lower, according to whether the instrument which plays it is smaller or larger than the Soprano in C.

9. The exact tuning of the transposing instruments is generally indicated by the name of the instrument itself—employing a designation borrowed from one of the divisions of the human voice which approximates the range of the instrument, viz.: Soprano, Alto, etc., together with the tonic-note in which the instrument is tuned ("in B \flat ," "in E \flat ," etc.). For example: the Soprano Saxophone in B \flat is approximately within the range of the Soprano voice, and is tuned in B-flat, one tone below the Soprano Saxophone in C.

There are instances, however,—e. g., Bass Flute, Bass Trumpet, etc.—in which the term *bass* is not employed after the manner of its application to the Bass voice, but derives its significance from the Italian word *basso*, meaning "low."

In the Horns, Oboes and a few other instruments the *voice-term* is not employed at all.

10. The *higher* the instrument is tuned above the typical Soprano in C of the family, the *lower* will its part be written below the actual sounds—and vice-versa. Examples: an E \flat -Sopranino is tuned a minor-third higher than the Soprano in C, therefore, its part will be written a minor-third lower; a B \flat -Tenor is tuned a major-ninth below the Soprano in C, therefore, its part will be written a major-ninth higher.

11. The parts for the low-voiced brass instruments—Saxhorns¹ and Tubas—are written in actual sounds, as the players cannot keep changing to instruments of higher intonation, due to the considerable difference in the *embouchure*, thus the uniform fingering system becomes absolutely unnecessary.

12. The Contra-Bassoon and Contra-Sarrusophone are written an octave above the actual sounds, like the string Double-Bass.

13. In all, there are four different notations used at the present time, as follows:—

I. Actual-sound Treble-clef: for the typical instrument of each family (Sopranos in C).

II. Transposing Treble-clef: for the instruments tuned higher or lower than the Soprano in C, except the non-transposing instruments, indicated below (notation III). Occasionally the transposing treble-clef is changed to transposing bass-clef, as in the case of the Horns and Bass-Clarinets in B \flat and A and Contrabass Clarinets in F and E \flat . (See Introduction.)

III. Actual-sound Bass-clef: for the middle² and low-voiced non-transposing instruments:—Bassoon, Sarrusophone, Tenor and Bass Trombone, Bass and Contrabass Saxhorns, B \flat -, E \flat - and BB \flat -Tubas and Contrabass Clarinet in C.

¹In France and Belgium, however, the transposing bass-clef notation is still used for the low-voiced Saxhorns (see Introduction, page 19).

²The middle-voiced instruments—Bassoon, Sarrusophone, Tenor Trombone and B \flat -Tuba—occasionally change to actual-sound tenor-clef.

IV. **Octave Bass-clef:** for the Contra-Bassoon, Contra-Sarrusophone and occasionally the Contrabass Clarinet in C.¹

14. Included in the following illustration (page 41)

are the transposing instruments which are mostly in use at the present time. The unison passages, transcribed for these instruments from the piano score, will show their respective notation.

EXPLANATORY NOTE

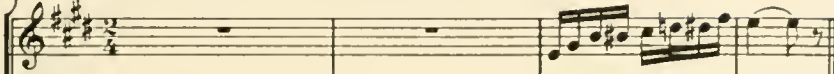

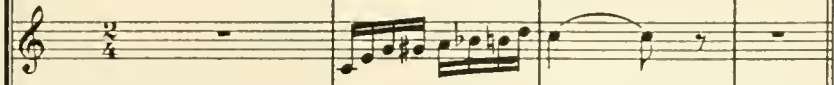

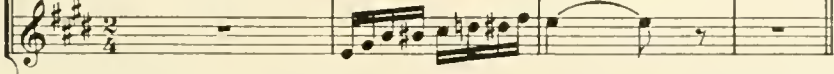
The Trumpets (in E \flat and F) and the Horns (in E \flat and F) correspond in their tuning to the Altos and Baritones respectively; but, owing to their compass extending to the highest harmonics (see table, page 71), and to avoid many added-line notes above the staff, the notation for these instruments has been

placed an octave lower than the regular transposing notation used by all the other valve instruments; their transposition, therefore, corresponds to that of the instruments voiced an octave higher, viz.: the Sopraninos and Altos.

¹The actual-sound bass-clef notation is much preferred by the players of the Contrabass-Clarinet (rather than the octave notation), as it obviates the difficult reading of the many added leger-lines in the high register or the necessity of changing to the auxiliary tenor-clef.


The Treble-Clef Transposing Instruments (mostly in use)
Playing in the Key of F-major in Unison with the Piano

Ascending transpositions

| | | |
|---|--|-------------|
| <i>Db Piccolo</i> |  | minor 9th |
| <i>C Piccolo</i> |  | octave |
| <i>Ab</i> [SOPRANINOS <i>Small Flute</i>] |  | minor 6th |
| <i>F</i> [SOPRANINOS <i>Trumpet</i>] |  | perfect 4th |
| <i>Eb</i> [SOPRANINOS <i>Small Flute</i> <i>Trumpet</i>] |  | minor 3rd |
| <i>Db Flute</i> |  | minor 2nd |

Tuned high-written low

PIANO



actual sounds

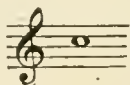
Descending transpositions

| | | |
|--|--|-------------|
| <i>Bb</i> [SOPRANOS MEZZO-SOPRANOS <i>Cornet</i> <i>Trumpet</i>] |  | major 2nd |
| <i>A</i> [SOPRANOS <i>Cornet</i> <i>Trumpet</i>] |  | minor 3rd |
| <i>F</i> [ALTOS <i>English Horn</i> <i>Horn</i>] |  | perfect 5th |
| <i>Eb</i> [ALTOS <i>Horn</i>] |  | major 6th |
| <i>C</i> [TENORS <i>Heckelphone</i> <i>Bass Trumpet</i>] |  | octave |
| <i>Bb</i> [TENORS BARITONES BASSES <i>Bass Trumpet</i>] |  | major 9th |
| <i>Eb</i> BARITONES |  | major 13th |

Tuned low-written high

15. It is most necessary that the instrumentator know how to write and read fluently the notes of the transposing instruments in their actual sound. For this indispensable acquirement the following method is the most correct and practical one:—

The 3rd space-C on the treble-clef



establishes a point-of-departure note for the seven *guide-clefs*, to be used in reading and writing the

parts for the transposing instruments. This note (C)¹ will be read in the **soprano-clef** as A when the transposing instrument is in A or A-flat; it will be read in the **tenor-clef** as B when the instrument is in B or B-flat; it will be read in the **bass-clef** as E when the instrument is in E or E-flat, etc.

16. The seven clefs which are used in reading or writing, in actual sounds, the parts of any transposing or non-transposing instrument, are as follows:—

| | G-clef | C-clefs | | | | F-clefs | |
|-----------------------------------|--------|-------------------|---------------|-------------------|--|----------|--|
| | Treble | Soprano | Mezzo-Soprano | Alto | Tenor | Baritone | Bass |
| Clefs and point of departure note | | | | | | | |
| Intonation of Instruments | in C | in A or A \flat | in F | in D or D \flat | in B or B \flat also the non-transposing middlevoiced instruments | in G | in E or E \flat also the non-transposing low-voiced instruments |

Observe the order of the notes in descending thirds: When the transposing treble-clef changes to the transposing bass-clef—as in the Bass Clarinets in B \flat or A; or the Horns, etc.—to read in actual sound, one should use as guide the preceding clef (in the above table); e. g., for the lowest notes of the Horn in F, written in bass-clef, use, as guide, the soprano-clef (which precedes the mezzo-soprano).

17. The key-signatures of the transposing instruments are readily determined in the following peculiar manner:—

The number of accidentals contained in the key of the instrument's intonation is deducted from the key-signature of the piece. For example, referring to the preceding table, page 41:—The instruments in A (which bear three sharps less or three flats more) in the key of F have *three* flats more—

equivalent to the key of A-flat major. The instruments in B \flat (two flats less or two sharps more) in the key of F, *one* flat less *plus one* sharp—equivalent to the key of G-major. The D \flat Piccolo (five flats less or five sharps more) in the key of F, *one* flat less *plus four* sharps—equivalent to the key of E-major, etc.

18. Now it remains to consider the changes in the accidentals throughout the piece, which appear when, by the use of the guide-clef, the notes are called in actual-sound; and this, also, is very simple:—Those notes which in the natural scale of a transposing instrument result flat or sharp, when in a modulation bear accidentals, are sharpened by \sharp or flattened by \flat when that scale is in sharps; they are sharpened by \times or flattened by \sharp when that scale is in flats.

¹The practice of Solfeggio, in this connection, is of great advantage, i.e. to sing the notes in their actual sound by using the syllable system: *Do, Re, Mi, Fa, Sol, La, Si* (see page 36); thus the point-of-departure note, *Do*, will be *La* (soprano-clef) for the instruments in A or A \flat ; *Si* (tenor-clef) for instruments in B or B \flat , etc.

EXAMPLES

For an instrument in A which contains in its intonation-key F-sharp, C-sharp and G-sharp, these *three* notes (if altered throughout the piece) on the guide-clef will result as follows:—

For an instrument in B \flat which contains in its intonation-key B-flat and E-flat, these *two* notes will result as follows:—

For an instrument in E \flat , which contains, in its intonation-key B-flat, E-flat, and A-flat, these *three* notes will result as follows:—

It follows, of course, that the alterations of the accidental-notes occur throughout all the octaves.

The other notes—those which are natural in the intonation-key of the instrument—whenever they are chromatically altered in the piece, would be similarly affected on the guide-clef by the same accidental.

It must be understood, however, that this is simply a guide by which to read and write (in actual sounds) the parts of the transposing instruments, as the seven guide-clefs used are by no means all correct in their octaves. By applying these clefs to the illustration on the transposing instruments

(page 41) the student will observe that the alto guide-clef of the D-flat Piccolo sounds two octaves *above* the actual alto-clef; the mezzo-soprano guide-clef of the Trumpet in F sounds an octave *above* the actual mezzo-soprano-clef; the tenor guide-clef of the B \flat -Sopranos also sounds an octave *above* the actual tenor-clef, etc.

Among all the transposing instruments referred to, only the guide-clefs of the Sopranos in A, Altos in F, Tenors in B \flat and Baritone in E \flat , correspond, in the correct octave, to the respective actual clefs of soprano, mezzo-soprano, tenor and bass.

CHAPTER III

THE CLARINETS

(KEYED CYLINDRICAL TUBE INSTRUMENTS)

(a) Types of Instruments and Notation

19. There are five distinct groups of Clarinets made today¹—all being cylindrical-tube and single-reed instruments:

- | | |
|--------------------------|---|
| (1) Sopranino Clarinets | $\left\{ \begin{array}{l} \text{in A}\flat \\ \text{in F} \\ \text{in E}\flat \\ \text{in D} \end{array} \right.$ |
| (2) Soprano Clarinets | $\left\{ \begin{array}{l} \text{in C}^2 \\ \text{in B}\flat \\ \text{in A} \end{array} \right.$ |
| (3) Alto Clarinets | $\left\{ \begin{array}{l} \text{in F}^3 \\ \text{in E}\flat \end{array} \right.$ |
| (4) Bass Clarinets | $\left\{ \begin{array}{l} \text{in C} \\ \text{in B}\flat \\ \text{in A} \end{array} \right.$ |
| (5) Contrabass Clarinets | $\left\{ \begin{array}{l} \text{in F} \\ \text{in E}\flat \\ \text{in C} \\ \text{in B}\flat \end{array} \right.$ |

20. The Soprano in C, the typical instrument of the family, is written in the treble-clef, actual sound.

For the Sopraninos, Sopranos in B \flat and A and Altos, the transposing treble-clef notation is used exclusively.

For the Basses, both the treble- and bass-clef transposing notations are used, with the exception of the bass-clef for the Bass-Clarinet in C, which corresponds to the actual sounds.

For the Contrabass Clarinet in C the notation in actual sound Bass-clef is preferable (see foot-note, page 40); the octave notation—the same as for String Double-bass—is also frequently used.

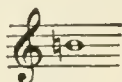
Various notations are employed for the Contrabass Clarinets in F, E \flat and B \flat —these are given in the Introduction (page 13).

(b) Harmonic Series and Scale

21. The first part of the scale on the Clarinets is produced by opening successively, from the bell-joint upward, a number of holes, some of which are covered by the fingers of the player and others by keys. This first part comprises nineteen semitones, which are all fundamentals (1st partial-tones) of the harmonic series as follows:—



Commencing from



for which note

all the holes are again covered, a second, ascending succession of nineteen semitones is produced with the same fingering⁴ of all the corresponding funda-

mentals, but with more air-pressure on the reed; thus giving, instead of the 2nd harmonics, the next nearest partial tones of unequal number, viz., 3rd harmonics, which are a 12th above the fundamentals:—

¹See figures on page 51.

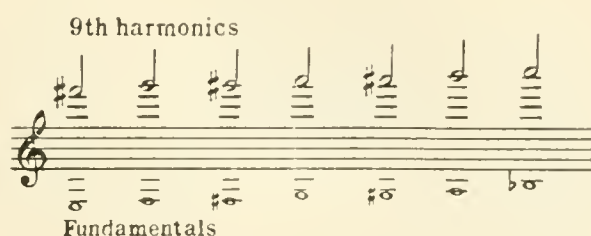
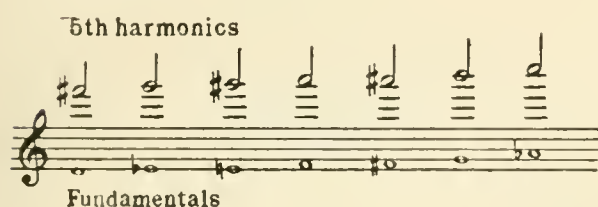
²The typical instrument.

³Also called **Bassett-Horn** (see page 12).

⁴On the Clarinets, and some others reed-instruments also, the emission of harmonics is facilitated by the opening of a small hole near the reed-joint, with the so-called "speaker-key" or "vent-key". Some instruments, as the Oboe, the Saxophones, etc., have a second speaker-key for the highest harmonics.



With further augmentation of the air-pressure the next harmonics of uneven number are obtained, viz., the 5th and the 9th (the 7th harmonics, being impracticable in the equal-temperament scale,—see page 37—are not used):—

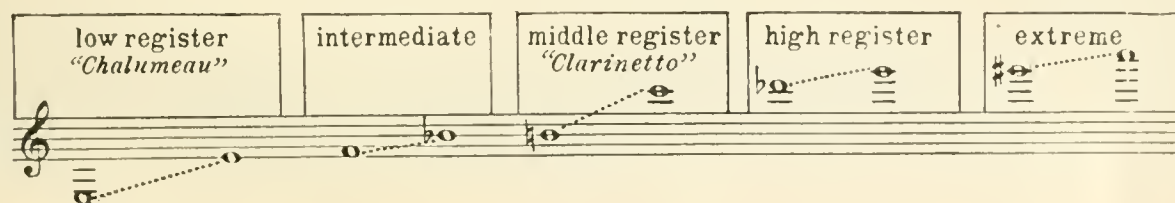


22. From upward, however, this "natural" fingering is not observed in most of the

notes; instead, "artificial" fingering is used to facilitate the emission of the sound, or to improve the tone-quality and intonation (see foot-note No. 3, page 52).

(c) Technique

23. The scale of the Clarinets is divided into five registers:—

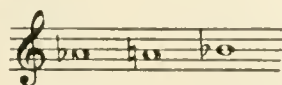


Each register possesses characteristics of its own:—

24. The **low register** *Chalumeau* is very sonorous, mellow and a little nasal; excellent for special effects, such as *tremolo*, sustained notes, slurred *arpeggi* etc., and it is the easiest register to execute.

25. The **intermediate register** is the weakest part of the instrument. It is suitable for soft rhythmical accompaniments or "dying away" *diminuendi*. In out-of-door music, this register is particularly suited to reinforce the low register of the Flute—and in other like instances. Quick passages on the last three

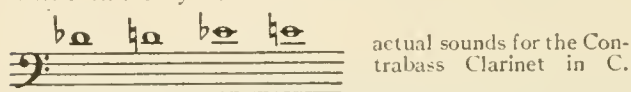
notes of this register,



should be avoided as much as possible, especially in solo passages or cadenzas.

26. The **middle register**, *Clarinetto*, is by far the best part of the scale—clear, sweet, but penetrating and very expressive. Upon it the instrumentator can depend in every instance, throughout all the various modes of expression employed in composition: from the placid, whispering (*sotto voce*) to the most elaborate, animated passage, either *legato* or *staccato*. The superb qualities of this register are sufficient to give the clarinets the first place among the wind instruments.

27. The **high register** is distinctly more reedy¹ than the middle-register—the *clarinetto*—but it is very good and effective in its character, and it is possible on all the Clarinets except the Contrabass, which can only reach the first four semitones:



28. The **extreme register** possible only on the Soprano and partly on the Sopranino Clarinets is more or less shrieking, according to the proficiency of the performer. This register is only employed in Clarinet Concertos, or other Clarinet Solos, but not in orchestra or band parts, save the occasional use of the first two or three semitones in a *tutti-fortissimo* of the band, when it occurs, to avoid the breaking of a high melody, or passage, in the first Soprano Clarinets.

The entire compass and notation of the different Clarinets is given in the Introduction, pages 12 and 13, and further, 34 and 35.

29. The Sopranino and Soprano Clarinets are as agile in execution as the Flute, almost approaching the Violin in velocity, both in *legato* and *staccato* passages, and in scales, *arpeggi*, fingered-tremolo, trills, etc.

These possibilities in the technique of the Clarinet are especially displayed in band music where the

Soprano Clarinets, together with the Sopranino excel in the principal part, as do the Violins in the orchestra.²

30. The other Clarinets—Alto, Bass and Contrabass—although the fingering is the same, the greater their size, the less adaptable are they to agile articulation, as the low tones are produced with a lesser number of vibrations to a second than the high tones; that is to say, the tones of the low-voiced instruments vibrate slower, and, therefore, are heavier and thicker than the more rapidly vibrating tones of the higher-voiced instruments, thereby losing in tonal-flexibility.—This also applies to every family of musical instruments.

There are limitations and difficulties in the rapid execution of some intervals of the Clarinets.

31. In general, it is to be remembered that passages formed of octave-skips are difficult on the cylindrical instruments—the Clarinets—as their fingering changes in each octave; whereas such passages become easier on all the conical instruments—Conic-wood and Brass, for they naturally overblow to the octave, retaining the same fingering throughout. For instance: the following passage, which is easy in execution for a Flute, a Saxophone and even for a Saxhorn, is quite difficult for the Clarinets—almost impossible in an *allegro* movement:—



This difference in the matter of easy and difficult execution between cylindrical and conical instruments appears in the octave skips only; throughout the other intervals all the keyed instruments (cylindrical or conical) are subject to about the same degree of difficulties according to the width of the interval, its fingering and rapidity of execution.


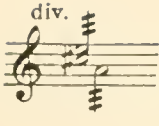
32. It is of prime importance in scoring to make sure that the trills and tremolos used are all practicable. In transcriptions from orchestra to band,

especially where the Clarinets are given (in *fingered-tremolo*) both the *fingered* and *bowed tremolo* of the strings, instances frequently appear, which, by the bad effect they produce, give evidence of the instrumentator's lack of technical knowledge in this particular.

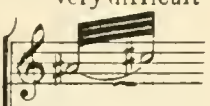
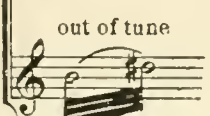
One has no plausible reason to give in excuse of such errors when, as in the case of band-scoring, he has at his disposal entire families of instruments to which he can distribute in many ways the tremolo-

¹Generally speaking this reedy quality of the high register occurs with the average Clarinet players, but today there are many skilled clarinetists who can play quite evenly both the middle and high registers with a beautiful *Clarinetto* quality.

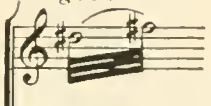
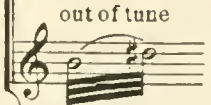
²"The B \flat Clarinets are to the Military-Band what the Violins are to the Orchestra. Indeed they are a good deal more, for whereas in the upper register of the orchestra the wood-wind instruments can take their proper share of extended figures and melodic passages, in the Military Band" (here meaning a band without Oboes and Saxophones), "the Clarinets alone can be used to give adequate emphasis to the transliterations of these parts." ("Orchestration" by Cecil Forsyth. MacMillan & Co., London.)

chord. For instance, an A-major chord of the first Violins *divisi*:  or  may be given to the Clarinet family in four different ways, with the following results:—


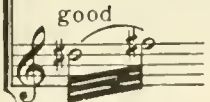
1

| | | |
|---------------------|---|------------------------------------|
| $E\flat$ Sopraninos |  | <i>very difficult</i> |
| $B\flat$ Sopranos I |  | <i>out of tune</i> <i>very bad</i> |

2

| | | |
|----------------------|---|-------------------------------|
| $B\flat$ Sopranos I |  | <i>good</i> |
| $B\flat$ Sopranos II |  | <i>out of tune</i> <i>bad</i> |

3

| | | |
|----------------------|--|--------------------------------|
| $B\flat$ Sopranos I |  | <i>difficult</i> |
| $B\flat$ Sopranos II |  | <i>good</i> <i>fairly good</i> |

4

| | | |
|-----------------------------|--|------------------------------|
| $B\flat$ Sopranos (I or II) |  | <i>good</i> |
| $E\flat$ Altos |  | <i>good</i> <i>very good</i> |

In the tables on page 49 can be found at a glance the various trills or tremolos possible for the Clarinets—the Sopranino, Soprano, Alto and Bass (*Boehm-system*), and the Contrabass (thirteen key, *Buffet-system*)—with special indications as to the degree of their difficulty.

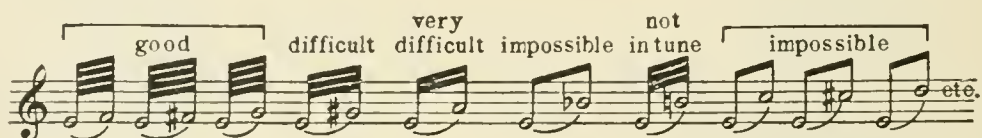
33. These tables, and also those given in the following chapter on the trills and tremolos of the Conic-wood (pages 56 and 57) are the result of careful experiments made, with the co-operation of competent performers on instruments of the most modern systems.

EXPLANATORY NOTE

In the following tables, the possible trills and tremolos are placed vertically, in *squares*, over each note of the entire chromatic scale of the instrument, beginning with the minor second and ascending—the intervals indicated in parallel position at the left of the tables.

The empty squares represent the easy trills and tremolos; the numbered squares represent the difficult or defective, and the crossed squares represent the impracticable ones—according to the annotations accompanying the tables; for example: the trills and

tremolos on the  of a Boehm-System Clarinet, result as follows:—




As a general rule, the smaller intervals are always the best.

Certain intervals, like the minor and major seventh and the octave, though of possible execution, are excluded from the tables because in any case of tremolo-effects it will be found unnecessary to make use of larger intervals than the 4th or 5th.

Remark:—When the Bass-clef notation is used for the Bass-Clarinet, the instrumentator will allow for the difference of an

octave between this clef and the written treble-clef in the table, thus, e.g., the first note of the scale



will correspond to  (See Introduction, page 13.)

The actual sound bass-clef notation is used for the Contrabass Clarinet in C.

(d) Quality of Tone

34. The tone of the Clarinets is the most beautiful of all the wind-instruments; rich, expressive and penetrating; suited to portray great diversity of emotional moods;—joy, love, tenderness, plaintiveness, grief, despair, dismay, etc.—according to the different registers of each of the five instruments of the family, used in all the various dynamic degrees from *pianissimo* to *fortissimo*.

35. Another quality in which the Clarinets excel over all the other instruments is their great tonal flexibility. Thus the Clarinets can be adapted to any desired effect, expressing with the same facility the whispering of the lightest breeze and the fury

of the hurricane. "No other instrument has so complete a command of $\ll \gg$ as the Clarinet. This applies to the whole of its compass, and to all the instruments of the Clarinet family. In especial, the Clarinet *ppp* is the nearest attainable approach to 'nothing at all' in the wind department."¹

36. Such qualities in the tone of the Clarinets have placed these instruments in the most prominent part of the band ensemble, viz.: the section which corresponds to that represented by the strings in the orchestra.

This important rôle of the Clarinet family is more extensively dealt with in Parts II and III.

¹"Orchestration" by Cecil Forsyth.

EXPLANATORY NOTE

The fundamentals are written in whole notes and the harmonics in half-notes, under which the proper generator (or fundamental) is indicated.

The low quarter-notes are obtained with the lengthening of the tube by closing, with special keys, certain large holes near the bell, and the high quarter-notes in the Saxophones and Bassoons are produced by opening small holes near the mouthpiece-joint.

The scale may be divided simply into low, middle, and high register.

The low register separated by bracket, thus:] is sonorous, but of little carrying power.

The middle register between the brackets, thus:][forms the most sonorous part of the scale, responding easily to every dynamic degree from *pianissimo* to *fortissimo*.

The high register, separated by a bracket, thus: [is generally thin in tonal quality.

Several of the extreme low and high notes in these scales are possible, but very difficult in some instruments of the family and impossible in others. For the sake of clearness, indications of such notes are omitted in this table, referring the student to the table of "The Band Instruments," on pages 34 and 35.

Harmonic Series and Scales of the Keyed-Conical Tube Instruments (Conic-wood)

54

| | |
|--------------|---|
| Lateral-hole | <p>PICCOLOS and FLUTES</p> |
| Single-reed | <p>SAXOPHONES</p> |
| Double-reed | <p>OBOE OBOE d'AMORE ENGLISH HORN HECKELPHONE</p> |
| Double-reed | <p>BASSOON and BASS SARRUSOPHONE in C</p> |
| Double-reed | <p>CONTRA-BASSOON and CONTRA-SARRUSOPHONE</p> |

(c) Technique

41. The keyed-conical tube instruments vary in agility of tone-production according to their mouth-piece.

The lateral-hole instruments (Flutes and Piccolos), being the quickest and easiest for attacking and producing the sounds, are the most agile in this section. They are unsurpassed in trills, rapid passages formed on scales or skips—slurred or *staccato*, in single- double- or triple-tonguing.

The single-reed instruments (Saxophones) come next in facility of technique, and last, the double-reed instruments (Oboes, Bassoons and Sarrusophones) which, although they allow of great possibilities in the hands of some *virtuosi*, are, nevertheless, the most difficult among the keyed instruments, and the prudent instrumentator will never risk employing them beyond the limit of medium velocity.

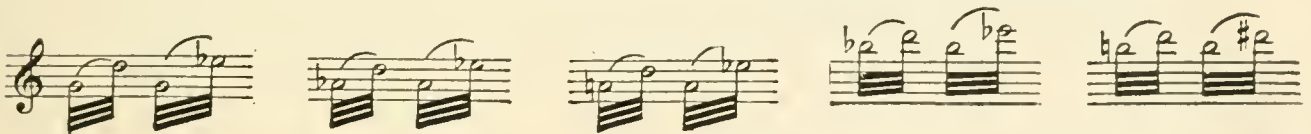
Generally speaking, with regard to each group of different mouthpieces—as already said of the Clarinet family (paragraph 30),—the smaller instruments are, by nature, the most agile in tone-production

42. In the score examples of Part II and III, the student will find practical illustrations of these hints regarding the "Conic-wood." But the diligent study of classical orchestral works is also indispensable for acquiring sufficient knowledge of the possibilities of these instruments.

It is essential, that the student always bear in mind certain limitations, beyond which the technique of each instrument fails to function; these are especially the emission of high and extreme notes—already indicated in the Introduction (pages 34 and 35)—and the execution of certain fingered tremolos and trills.

43. In the following tables (pages 56 and 57) the student will find a complete account, easy to refer to, whenever he employs the conic-wood instruments in trills or tremolos.¹ These tables are compiled in the same manner as those given for the trills and tremolos of the Clarinets; the student, therefore, is referred to page 46, paragraphs 32 and 33, and subsequent explanatory note (page 48), where the correct use of the tables is duly explained.

¹The following tremolos, which are difficult or impracticable on the ordinary Boehm-Flute (as given in the Flute table) can however, be easily played on the Boehm-Flute with the special C-sharp trill-key, made by Wm. S. Haynes Co., Boston, Mass.



Tables of Trills and Tremolos for the most used Keyed Conical Tube Instruments

Explanatory: good; 1 difficult; 2 very difficult; 3 to be avoided in *pp*; 4 defective intonation; X impracticable.

Flutes and Piccolos (Boehm System)

(Compiled with the kind assistance of Mr. C.K. North,
of the Detroit Symphony Orchestra)

| | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----------------------|---|---|---|---|---|--|--|--|--|---|---|---|---|---|--|---|---|---|---|---|---|---|---|
| Tremolos | maj. 6th | 1 | | 1 | 3 | 3 | | | | | | | | | | | | | | | | | | |
| | min. 6th (augm. 5th) | 2 | | | 1 | 3 | | | | | | | | | | | | | | | | | | |
| | perf. 5th | | 2 | | 1 | | | | | | | 2 | | 2 | | | | | | | | | | |
| | dim. 5th (augm. 4th) | | | 2 | | 2 | | | | | | 2 | | 1 | 2 | | | | | | | | | |
| | perf. 4th | | | | 2 | | | | | | X | | | 2 | | | | | | | | | | |
| | maj. 3rd | | | | | 4 | | | | | | 1 | | 4 | | | | 2 | | | | 4 | 3 | |
| Trills | min. 3rd | X | 4 | | | 4 | | | | | | | 4 | | | | 2 | | 3 | 4 | 3 | 3 | | |
| | maj. 2nd | | X | | | | | | | | | | | | | | | | | 4 | | | 3 | 3 |
| | min. 2nd | X | | | | | | | | | | | | | | | | | | | | | 3 | 3 |

Piccolo
Flute

Oboe and English Horn (Paris Conservatory System)

(Compiled with the kind assistance of Mr. Clément
Lenorm, of the Boston Symphony Orchestra)

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----------------------|---|---|--|--|--|--|--|--|--|--|--|--|--|--|--|--|---|---|---|---|---|---|--|--|--|--|--|
| Tremolos | maj. 6th | | X | | | | | | | | | | | | | | | 2 | | | | | | | | | | |
| | min. 6th (augm. 5th) | | | | | | | | | | | | | | | | | 2 | | | | | | | | | | |
| | perf. 5th | | | | | | | | | | | | | | | | | 3 | | | | | | | | | | |
| | dim. 5th (augm. 4th) | | 1 | | | | | | | | | | | | | | | 1 | 1 | | | | | | | | | |
| | perf. 4th | X | | | | | | | | | | | | | | | | | | 2 | | | | | | | | |
| | maj. 3rd | | X | | | | | | | | | | | | | | | | | | | | | | | | | |
| Trills | min. 3rd | 3 | 1 | | | | | | | | | | | | | | | | | 1 | 1 | 1 | 4 | | | | | |
| | maj. 2nd | | 2 | | | | | | | | | | | | | | | | | | | | 4 | | | | | |
| | min. 2nd | X | X | | | | | | | | | | | | | | | 4 | | | | | | | | | | |

English Horn
Oboe

(d) Quality of Tone

44 It is difficult to give an adequate description of the timbre of the various instruments.—There is only one practical way of teaching a child to distinguish the colors red, blue and yellow, and that is by a demonstration and identification for him of these particular hues. And so it is with the tonal quality of each of the various instruments. A knowledge of them cannot be obtained by verbal description. One must actually hear the sound produced by the Oboe, Clarinet or Trumpet to become familiar with the individual tonal-characteristics of these instruments.¹

The following points on the conic-wood instruments, however, will help to impress upon the student's mind the quality of tone that he hears whenever the occasion is offered to him.²

PICCOLO:—Brilliant and hard in tonal-quality, suited for the depiction of joyous, festival scenes; storm-effects; embellishments in marching music and in octave-melodies in *tutti-fortissimo*.

FLUTE:—The sweetest-toned of all the instruments; appropriate for the expression of happy moods; soft whisperings of Nature sounds; plaintive loneliness and sadness.

SAXOPHONES:—Mellow and penetrating tone of veiled quality, partaking somewhat of the Clarinet and English-horn, but much more sonorous.

OBOE:—Thin and somewhat nasal tone; lyrical and charming when *piano*, piercing when *forte*; especially suited for portraying pensive, pastoral scenes, or lonely, melancholy moods.

ENGLISH-HORN:—Smooth and rich quality of tone, reminding one a little of the Alto voice. For reminiscent moods, tragic or pathetic

scenes, it is unsurpassed by any other instrument.

BASSOON:—Versatile in tonal-quality according to the requirements of the mood for depiction. Sustained *legato* passages in the low register are either dignified, mysterious, solemn or pontifical in character; in the medium register, sweet, gentle and persuasive, somewhat resembling a distant Baritone-voice; in the high register, thin and plaintive. *Staccato* passages, when *piano* and *mezzo-forte* are droll and sportive in their effects, and grotesque when *forte*. The Bassoons have less carrying power than any other wind instrument.

CONTRA-BASSOON:—The lowest octave has a tonal character peculiarly its own: it continues homogeneously the downward compass of the Bassoon, but the vibrations of its large double-reed become slower and increasingly more noticeable when descending the scale towards the lowest fifth—the tones partaking of a “drummy” effect and the intonation-pitch becoming very indistinct. The middle and high registers resemble, more or less, the respective low and medium registers of the Bassoon, but lacking in delicacy. Very weak in carrying power, like the Bassoon.

SARRUSOPHONE:—Same tone-color as that of the Bassoons, though a little thicker in quality, but much more sonorous and of splendid carrying power, thus rendering these instruments excellent substitutes for the Bassoons in outdoor music.

CONTRA-SARRUSOPHONE:—Same timbre as that of the Contra-Bassoon, but much richer and of great carrying power even when used out-of-doors.

¹See page 9, last paragraph.

²In addition, the student is recommended to read standard works upon instrumentation or orchestration, as Berlioz, Gevaert, Forsyth, Widor, Hofmann, Prout, etc.

CHAPTER V

THE BRASS

(CUP MOUTHPIECE INSTRUMENTS)

(a) Types of Instruments and Notation

45. At the present time, the brass instruments are found in a great variety of models and shapes and (excepting those which have a permanent place in the orchestra, viz.: the Horns, Trumpets and Trombones) they are known by the most diversified nomenclature, and treated in infinitely varied combinations in the band scores of today. In order that we may co-ordinate our ideas, and comprehend more clearly the situation, it is necessary that we first briefly consider the origin and evolution of certain instruments which are more affected by the present-day chaotic condition in terminology and usage. These particular instruments are the SAXHORNS and TUBAS.

46. The original family of the Saxhorns, invented by Adolph Sax, in 1842, contained the following seven different types:—

- (a) Sopranino in E \flat
- (b) Soprano in B \flat
- (c) Alto in E \flat
- (d) Tenor or Baritone in B \flat
- (e) Bass in B \flat
- (f) Low-Bass in E \flat
- (g) Contrabass in B \flat

47. At the present time, instruments of the nature of the Saxhorns are found in eight different types,¹ namely:—

1. The **Sopranino Saxhorn** in E \flat or its fac-simile, the E \flat -Cornet, or Piston in E \flat ; same as the original Sopranino (a).
2. The **Soprano Saxhorn** in B \flat or its fac-simile, the B \flat -Cornet with conical-tube and Saxhorn-mouthpiece; tubing comparatively small—of practically the same diameter as

that of the Sopranino but of the length of the original Soprano (b).

3. The **Mezzo-Soprano Saxhorns** in B \flat or its fac-simile, the Flugelhorn or Bugle; tubing of the same length as that of the original Soprano (b), but slightly larger.

4. The **Alto Saxhorn** in E \flat practically the same as the original (c).

5. The **Tenor Saxhorn** in B \flat practically the same as the original (d).

6. The **Baritone Saxhorn** in B \flat practically the same as the original (e).

7. The **Bass Saxhorn** in E \flat practically the same as the original (f).

8. The **Contrabass Saxhorn** in B \flat practically the same as the original (g).

The foregoing nomenclature is the most appropriate to the modern instruments, and will greatly aid in the correct employment of this family of brass instruments.

48. The Saxhorns are, or are supposed to be, instruments with a bell-cup mouthpiece (figure B, page 65) and short conical-tube, all having three valves—the additional fourth valve being quite impracticable on instruments of marked conical-tube.

49. The first four Saxhorns—Sopranino, Soprano, Mezzo-Soprano and Alto²—are of horizontal or Bugle shape, and the last four—Tenor, Baritone, Bass and Contrabass—of vertical or Ophicleide shape, preferably with the bell bent towards the front (see page 77). This feature (the front bell) in the vertical Saxhorns has proved to be very efficient in preventing the retardation or the dragging response so accentuated in the mellow-tone of these large instruments.

The last two Saxhorns are also made in circular form, thus to render them more portable for

¹See figures on pages 76 and 77.

²Alto Saxhorns of vertical shape, known as "E \flat -Altos," are also used in some bands; often they take the parts of the E \flat -Horns, in absence of these instruments (see page 32).

marching; in this model, also, the bell is bent toward the front (see page 78).

50. The Sopranino Saxhorn is not generally used, except in Fanfare¹ (Brass Band)—because of the difficulty of its intonation, very few cornetists are willing to play this instrument. The modern Soprano Saxhorn (the B \flat -Cornet), however,—the high notes of which being much easier to obtain than the Sopranino's—reaches with almost the same facility the compass of the latter instrument, thus bringing to nought the only *raison d'être* of the Sopranino. Apart from the high notes in its compass, the Sopranino possesses no superiority over the Soprano, wither in its tonal quality or possibilities of technique. Moreover, the low register of the Soprano (five additional semitones) is lacking entirely in the compass of the Sopranino. The gradual disuse of the little Saxhorn is therefore not surprising.

51. Aside from the Sopranino, all the other Saxhorns, from the Soprano downward—either as complete or incomplete family—are used in every civilian or military band in all countries.

52. There are other instruments in use today which are simply modifications of the Saxhorns, and for this reason they are considered, and described in most works upon instrumentation, as such. It is better, however, to distinguish these modified instruments from the real Saxhorns by designating them with the name—which they have acquired internationally—of TUBAS,² thereby obtaining a

definite designation for that section of the Brass which may or may not be employed by composers and bandmasters, according to the requirements of the organization.

53. The family of Tubas used today contain the following five instruments:—

Alto Tuba in E \flat derived from the modern Saxhorn, No. 4 (page 61).

Tenor Tuba in B \flat derived from the modern Saxhorn, No. 5 (page 61).

Baritone Tuba in B \flat ³ (generally known as *Euphonium*) derived from the modern Saxhorn, No. 6 (page 61).

Bass Tuba in F or E \flat derived from the modern Saxhorn, No. 7 (page 61).

Contrabass Tuba in C or B \flat derived from the modern Saxhorn, No. 8 (page 61).

54. The difference between the Saxhorns and the Tubas consists in the latter having a deep bowl-cup mouthpiece⁴ (see figure C, page 65); a tube which is about one-third its length cylindrical and two-thirds conical; four valves and bell straight upright.

In consequence of these differences, the Tubas produce a tone of a lighter shade,—something between the Horn and the Trombone,—whereas the mellow-tone of the Saxhorns pertains to the darker shades of all the brass instruments.

It is therefore necessary to make a distinction between the Saxhorns and Tubas when employing these instruments in the modern band score.

¹In Italy, the Sopranino Saxhorn has been introduced of late in the Infantry Band in place of the *Cornet Soloist*. In France and Belgium some large Military Bands and Fanfares also use the Sopranino Saxhorn, but not as a solo instrument.

²The Saxtrombas, instrument invented by Adolph Sax towards the middle of the nineteenth century—which never reached international popularity and soon became obsolete—are described as possessing approximately the characteristics of the modern Tubas. The intonation, harmonic-series and scale of the Saxtrombas are the same as on the original Saxhorns (Paragraph 46). In addition, however, a little Sopranino (Super-acute Saxtromba in B \flat), tuned a perfect fifth above the E \flat Sopranino Saxhorn, completes the family of the Saxtrombas. The compass of this instrument is given by Gevaert (*Nouveau traité d'Instrumentation*) as follows:



³Alberto Franchetti employed in his opera *Germania* four B \flat -Tubas (Euphoniums)—indicated as *Tubas in C*—and one Bass Tuba.

⁴The *Tuben* that Wagner introduced in the orchestration of the *Ring von Nibelungen* were supposed to be played with a Horn mouthpiece; this the Master wanted, presumably, with the thought that these instruments would blend better with the Horns, Trumpets and Trombones, and also for reaching the high harmonies obtainable on the Horn, of which harmonies he took advantage in the first combination of Tubas—two *Tenor-Tuben* in B (B \flat) and two *Bass-Tuben* in F. In fact, in this first combination, Wagner used the same notation of the respective Horn in B \flat -Alto and Horn in F;—whereas for the second combination—two *Tenor-Tuben* in E (E \flat) and two *Bass-Tuben* in B (B \flat)—he used the same notations as for the Alto and Tenor-Saxhorns, to which they correspond (see Introduction, page 20).

Wagner's idea of the Horn mouthpiece, however (as well as in the instance of his changing of notation, which he indicates in the score of *Walküre* as "ease of score-reading!") has not been followed, for the simple reason that it was impracticable, and now the parts of these *Tuben* are played either with real Tubas or with Saxhorns.

In order to aid the student in identifying the Saxhorns and Tubas as they are indicated in American and foreign orchestra- or band-scores (or parts) the following list of these instruments (page 64) includes not only their proper technical names, but also the various common designations by which they are known at the present time.

55. It will be noticed in this list that the Soprano Saxhorn and the modern conical-bore B \flat -Cornet are considered as identically the same instrument. It must be observed, however, that the Cornets (in

B \flat or A), generally used in small orchestra in place of the Trumpets, are built on the principle of the Tubas—with their tubing one-third of the length cylindrical, and two-thirds conical,¹ and are played with a deep bowl-cup mouthpiece (figure C, page 65); but in the band the real Soprano Saxhorns (conical bore) are to be preferred to attain the necessary contrast of tone-color between these instruments and the Trumpets; whereas, with the partly-cylindrical-bore Cornets, such a contrast is lost.

¹See Introduction, page 20.

TECHNICAL AND COMMON NAMES OF THE SAXHORNS AND TUBAS

| | | Technical Names | | Common Names | | | |
|-----------------------------|--|--|---|--|--|---|--|
| | | English | English | Italian | French | German | |
| Horizontal form | 3-valve, bell-cup mouthpiece and tubing all conical | SOPRANINO SAXHORN in E \flat figure 20, page 76 | { E \flat -Cornet E \flat -Bugle | <i>Pistonino</i> <i>Flicorno Sopranino</i> | <i>Petit Bugle</i> <i>Bugle Soprano</i> <i>Bugle Sopranino</i> | <i>Piccolo Cornet in Es</i> | |
| | | SOPRANO SAXHORN in B \flat figures 21 and 22, page 76 | { B \flat -Cornet Small Bore Flugelhorn | <i>Cornetta a Pistoni</i> <i>Cornetta Francese</i> | <i>Cornet-à-Pistons</i> <i>Saxtromba Soprano</i> | <i>Piston in B</i> <i>Soprano Cornet</i> | |
| | | MEZZO-SOPRANO SAXHORN , in B \flat figure 23, page 76 | { Bugle Flugelhorn | <i>Flicorno</i> <i>Flicorno Soprano</i> | <i>Bugle</i> <i>Grand Bugle</i> <i>Bugle Contralto</i> | <i>Flügelhorn</i> | |
| | | ALTO SAXHORN in E \flat figure 24, page 76 | { Alto-Cornet Bass Trumpet in E \flat | <i>Flicorno Contralto</i> | <i>Bugle Alto</i> | <i>Althorn</i> <i>Alto Cornet in Es</i> | |
| | | TENOR SAXHORN in B \flat figure 25, page 77 | { B \flat -Tenor Tenor-horn | <i>Basso-flicorno</i> <i>Flicorno Tenore</i> | <i>Ténor en Si\flat</i> <i>Bugle Baryton</i> | <i>Tenorhorn</i> | |
| | | BARITONE SAXHORN in B \flat figure 26, page 77 | { Baritone B \flat -Bass | <i>Bombardino</i> <i>Flicorno Barilono</i> | <i>Baryton</i> | <i>Baryton</i> | |
| Vertical form; front bell | 3-valve, bell-cup mouthpiece and tubing all conical | BASS SAXHORN in E \flat figure 27, page 77 | { E \flat -Bass E \flat -Bombardon | <i>Bombardone in Mi\flat</i> <i>Flicorno Basso-Grave</i> | <i>Bombardon en Mi\flat</i> <i>Contrabass en Mi\flat</i> | <i>Bass in Es</i> | |
| | | CONTRABASS SAXHORN in B \flat figure 28, page 77 | { BB \flat -Bass | <i>Pellitone</i> <i>Flicorno Contra-</i> <i>basso</i> | <i>Hélicon</i> <i>Contrabasse en Si\flat</i> | <i>Kontrabass in B</i> | |
| | | ALTO TUBA in E \flat figure 31, page 79 | { E \flat -Alto E \flat -Tenor | <i>Clavicorno in Mi\flat</i> <i>Genis, Sax</i> | <i>Saxhorn Ténor en Mi\flat</i> <i>Saxtromba en Mi\flat</i> | <i>Tuba Alto in Es</i> | |
| | | TENOR TUBA in B \flat figure 32, page 79 | { Tenor-Tuba | <i>Clavicorno in Si\flat</i> | <i>Tuba Ténor</i> | <i>Tuba Tenor in B</i> | |
| | | BARITONE TUBA in B \flat figure 33, page 79 | { Euphonium B \flat -Tuba | <i>Eufonio</i> <i>Bassetto in Si\flat</i> | <i>Tuba en Si\flat</i> <i>Basse en Si\flat</i> | <i>Euphonion</i> <i>Tuba in B</i> | |
| | | BASS TUBA { in F in E \flat figure 34, page 79 | { Tuba F- and E \flat -Tubas | <i>Bassi in Fa e Mi\flat</i> | <i>Tuba-Basse</i> <i>Saxtromba Basse</i> | <i>Bass-Tuba</i> | |
| Vertical form; upright bell | 4-valve, deep bowl-cup mouthpiece and tubing $\frac{2}{3}$ cylindrical and $\frac{1}{3}$ conical | CONTRABASS TUBA { in C in B \flat figure 35, page 79 | { Bass-Tuba CC- and BB \flat -Tubas | <i>Bassi in Do e Si\flat</i> | <i>Tuba-Contrabasse</i> <i>Saxtromba</i> <i>Contrabasse</i> | <i>Kontrabass-Tuba</i> | |

56. The first six Saxhorns—Sopranino to Baritone—are written for in the transposing Treble-clef; the last two, Bass and Contrabass, in actual-sounds, Bass-clef.

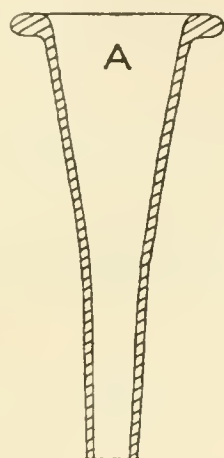
The Alto and Tenor Tubas are written for in the transposing Treble-clef, and the Baritone, Bass and Contrabass Tubas in actual-sounds, bass-clef.

The other brass instruments, viz.: Horns, Trumpets and Trombones, all having a distinct part in the Symphony Orchestra, are more under the con-

trol of competent musicians—composers and conductors—and, therefore, are found only in *standard models*, and are known internationally under their proper names. For the Horns' and Trumpets' notations (see explanatory note, page 40). The actual sound—tenor or bass-clef—notation is used for the Trombones.

57. The modern brass instruments will thus be classified, after the shape of their respective mouthpieces and their tubing, as follows:—

HORN

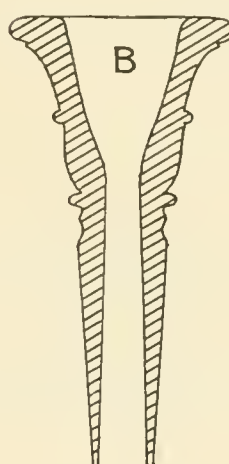


Conic-cup
mouthpiece.

Tubing:—long, narrow and
conical.

Side bell.

SAXHORNS

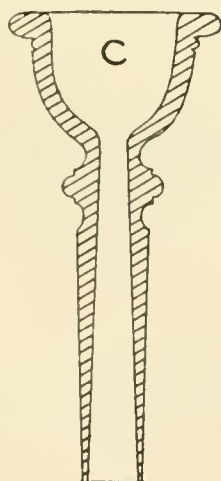


Bell-cup
mouthpiece.

Tubing:—short and conical
in all its length.

Front bell.

TUBAS

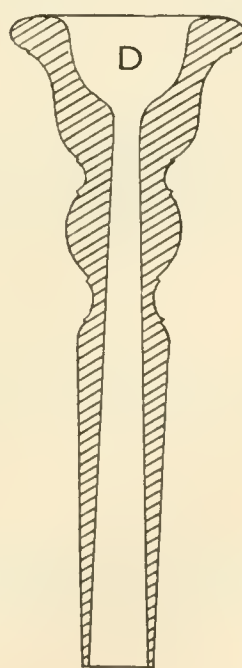


Deep bowl-cup
mouthpiece.

Tubing:—one-third of the
length cylindrical and
two-thirds conical.

Upright bell.

TRUMPETS and TROMBONES



Shallow bowl-cup
mouthpiece.

Tubing:—two-thirds of the
length cylindrical and
one-third conical.

Front bell.

Note.—Figure A, in the preceding page, shows the correct size of the only conic-cup (Horn) mouthpiece.

Figures B, C and D show the correct size of mouthpieces for the Sopranos¹ of each group of instruments. The mouthpieces of the other instruments in the group retain the same shape of the Soprano mouthpiece, but increase in size as the instruments are voiced lower.

The Slide-Trombone mouthpiece—though having, in its proportion, the same shallow cup as figure D—is constructed differently in the lower part, i. e.: the shank is made either almost cylindrical in its exterior (in order to set in the tube in place of the so-called “leader”) or, if a “leader” is built into the instrument, the shank is then made shorter, like that of the Tuba mouthpiece—(Fig. C).

(b) Harmonic Series and Scale

58. The cup-mouthpiece instruments, owing to their tube (conical in its whole length or in part) work also on the principle of the open-pipes, giving the same fundamental tone as an open-pipe of the same length, and the harmonic-series in natural order, with the partial-tones of even and uneven numbers.

The narrower and longer the tubing of these instruments, the greater is the number of the harmonics produced (paragraph 4).

59. Every brass instrument, without the use of valve or slide, produces with its principal tube the harmonic-series of the fundamental tone in which it is tuned, i. e.: the Horn in F gives the harmonic-series of F. The principal tube, however, can be

lengthened so as to tune the instrument from one to six semitones lower; thus producing, with the principal tube, seven different harmonic-series.

For instantaneous changes, from one to another, of these seven different pitches, two different devices are employed, viz.: (1) the slide on the Slide-Trombones, and (2) the valves on all the other brass instruments.

The slide, which is controlled by the player's hand, varies the length of the tube from the 1st to the 7th position, so-called, approximately as follows:—For the 1st position the slide is closed; from the 1st to the 2nd position the slide is extended $3\frac{3}{16}$ inches; from the 2nd to the 3rd position the slide is extended $3\frac{1}{2}$ inches; from the 3rd to the 4th position the slide is extended $3\frac{13}{16}$ inches; from the 4th to the 5th position the slide is extended $4\frac{1}{8}$ inches; from the 5th to the 6th position the slide is extended $4\frac{7}{16}$ inches; from the 6th to the 7th position the slide is extended $4\frac{3}{4}$ inches.²

60. **The valves** open communication from the principal tube to three additional tubes, so disposed:—

| 1 | 2 | 3 |
|--------|---------------------|---------------------|
| 1 tone | $1\frac{1}{2}$ tone | $1\frac{1}{2}$ tone |

Using a Tenor Slide-Trombone, which is tuned in B \flat , and a valve instrument of the same pitch, e. g., a B \flat -Tenor Saxhorn (written for in actual sound) the result will be that the two instruments will perform the same seven harmonic-series, as shown on the following page.

¹The Soprano of the Tuba family is in reality the Cornet-à-pistons (see paragraph 55).

²The above numbers in inches are doubled when referring to the total length of tube, as the slide is formed of *two* parallel tubes, connected at the bottom, forming a U shape (see page 80); thus to tune the Trombone from one to six semitones lower, the tube measurement of each change is increased $\frac{3}{8}$ in. for every semitone.

62. The three-valve system, that won preference over the six independent-valve system because of its practicability and lightness, has, however, the following defects, which are worth the consideration of the conscientious instrumentator.

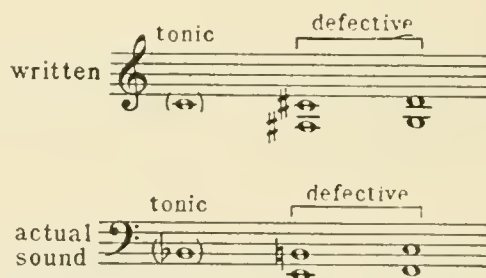
The last three harmonic series ($G\flat$, F and E)—for performing which more than a single valve is required—lack in their intonation, because the two or three additional tubes, used simultaneously, do not measure the exact and necessary length to lower the instrument to that pitch¹. This is easily explained:—

The Tenor (slide) Trombone (in $B\flat$), from the G to the $G\flat$ series, lengthens its tube $8\frac{1}{4}$ inches; from the $G\flat$ to the F series lengthens its tube $8\frac{7}{8}$ inches; from the F to the E series lengthens its tube $9\frac{1}{2}$ inches (see foot-note No. 2, page 66).

On the contrary, the Tenor Saxhorn in $B\flat$ —for each of the above three changes—always lengthens its tube about $6\frac{1}{2}$ inches, thus:—the $G\flat$ -series results about $\frac{1}{12}$ of a tone sharp; the F-series results about $\frac{1}{6}$ of a tone sharp; the E-series results about $\frac{1}{3}$ of a tone sharp.

The player, with his lips, can easily correct the 5th series, but not so the 6th and 7th, for which a very unnatural lip-pressure is required in order to approach the right intonation. In consequence of this lip effort the tone becomes deadened, unsteady, weak and very difficult of attack.

63. Fortunately, however, only the harmonics 2 and 3 of the 6th and 7th series are found to be used on valve instruments, for the tones of the higher harmonics are also found in the upper series, where they are preferred for their intonation and quality of tone. These false tones of the 6th and 7th series, however, if overlooked, are enough to spoil a passage of otherwise good scoring, especially so if they are in a prominent solo part or in sustained chords. The instrumentator must avoid them by interchanging the notes with other instruments of different pitch. The four defective tones are easy to remember; they are the first and second semitones above the *tonic-note* of the instrument, with their respective descending perfect fifths, e. g., on the Tenor Saxhorn in $B\flat$ the four defective tones are these:—



64. Among the valve instruments the Horns and Tubas are exempt from these defects—the Horn-players being able to correct them by changing the position of the hand within the bell, and the Tuba-players by using the fourth additional valve.

65. **The fourth-valve** (which adds—to the length of instrument—the respective fourth additional tube) generally lowers the instrument a perfect fourth,² i. e., it takes the place of the first-valve (one whole tone) and third-valve (one and a half-

¹Some instrument makers have, of late, invented a new device called "compensating valves" or "enharmonic valves," intended to correct the discrepancy of the three-valve system. It consists of extra *pipe-loops*, which enter into communication with the regular additional tubes when these are used in combination, viz.: 2-3, 1-3 and 1-2-3. A device of this nature, if it could be perfected, would mean an immense improvement in the construction of valve instruments.

²Other intonations are occasionally given to the fourth-valve, viz.: a minor-third lower, a diminished-fifth lower, etc. from the *tonic-note* of the instrument; but the perfect-fourth lower is the universally accepted intonation.

For the sake of completeness we may mention here a new Trumpet in C (yet unknown to us) invented by M. Franquin, of the Paris Conservatory. It is described as having "the three original valves unaltered and the addition of two new valves:—the fourth valve raises the instrument by a tone and, the fifth lowers it by a tone and a half or two, as one chooses" (?).

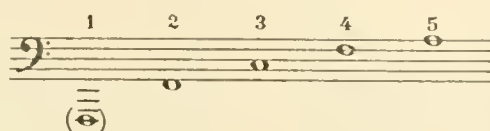
tone) together, and it serves, to obtain the 6th position in perfect tune; the 7th position with the combination of the second and fourth valves, is also much better in tune than with the first, second and third valves.

66. It is a mistake, however, to believe that the fourth valve can also be used to extend the downward compass of the instrument. This wrong principle—advocated in some text books in consequence of insufficient knowledge of the valve system—has lead composers and instrumentators to write occasional passages beyond the lowest limit of the Tubas—passages, therefore, which must be

played either an octave higher, or, with the use of the fourth valve, out of tune, producing in both cases—especially the last—undesirable effects.

One example will suffice to show plainly the illogicalness of this principle:—

Take, for instance, the B♭-Tuba (Euphonium) and tie down permanently its fourth valve, thus bringing into function the fourth additional tube, you then have the instrument tuned down a perfect fourth, which, together with an F-Tuba playing in the 1st position, will produce in unison the following harmonic series:—



Let us consider the two instruments both *F-Tubas*, and let them play the other six positions with the same fingering From what follows you will soon be convinced that a Euphonium changed to F-Tuba only in the main tubing, retaining its three small additional tubes, is not very agreeable to the ear—even the *profane ear*!

67. The fourth valve is not employed on the Trumpet¹—possibly because the additional weight

would be objectionable to the players of this instrument.

On the Saxhorns, owing to their tubing being conical throughout their length, the fourth valve is not wholly practicable: the long additional tube interrupting the taper of the instrument, would surely impair its scale.

68. The harmonic-series and scales of the most used cup-mouthpiece instruments are given in the table on page 71.

¹See foot-note page 68.

EXPLANATORY NOTE

In the following table, the fundamental tones, No. 1 (when contained in the instrument), are indicated in whole notes; the harmonics, Nos. 2, 3, 4, etc. of the first series are indicated in half-notes, and the tones produced with the use of the slide or valves (not numbered), in quarter-notes.

The extreme low notes, which are divided off by brackets, thus:], are dull in their *timbre*, somewhat heavy, though not powerful, and difficult to attack. The extreme high notes, divided by brackets, thus: [, are more or less forced, thin, and very difficult to attack, especially in *pianissimo* (see also table on The Band Instruments, pages 34 and 35).

The dotted line indicates the "middle register," the easiest and most effective part of the instrument.

In this table, it will be observed that the instruments of longer and narrower tubing reach the higher harmonics, but do not produce the fundamentals.

The partial tones, 7, 11, 13 and 14, which do not correspond to the equal temperament scale, are not used on valve instruments, with the exception of the Horn, for the reason that the player of this instru-

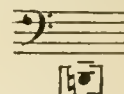
ment can correct them by shifting his hand in the bell, as he corrects the discrepancies of the three-valve mechanism (paragraph 62).

With the exception of the Horns and Tubas—the latter having the fourth additional tube (paragraph 65)—the defective notes of the 6th and 7th series to be avoided in the other instruments, are all marked with a cross, thus: +

The Bass-Trombone indicated in this table is now used in many bands and orchestras in the third or fourth Trombone part. It is a large bore, B \flat slide Trombone, with an additional tube and relative valve—similar to the fourth valve of the Tubas—which lowers the instrument a perfect fourth: to F. Note that

the low B-natural indicated

between two brackets:



is lacking in the compass—the 7th position required to produce this tone, extending beyond the reach of the player's arm.

Harmonic Series and Scale of the most used Brass Instruments

Horn (in F or E^b)

Transposing Saxhorns
Soprano (or Cornet) and Tenor
Soprano, Mezzo-Soprano, Alto and Baritone

Saxhorns (Bass Contrabass)

Tubas (B^b, E^b, E^b)

Trumpet in B^b or A (1)

Tenor Trombone

Bass Trombone (in B^b and F)

(1) The Trumpets in E^b and F play the same harmonic series and scale of the respective Horns in E^b and F, sounding an octave higher than these instruments. The highest harmonic reached is the 12th.
B.M. Co. 6244

(c) Technique

69. The brass instruments in general can display more agility in their middle register—that is (referring to the preceding table) the notes comprised within the dotted line. In this part of the compass the instrumentator can rely for any dynamic degree from the extreme *pianissimo* to the most powerful *fortissimo* in either sustained notes, *legato* or *staccato* passages, etc.

70. Only in the middle register can the Horns, Trumpets and Trombones and the high Saxhorns be muted with good results—it is practically impossible to use the low Saxhorns and Tubas with mute, on account of the large bell of these instruments.

71. The technique for the cup-mouthpiece instruments—more than the other wind instruments—is affected by a natural law, whereby the difficulty in execution increases in proportion to the increasing size of the instrument (see paragraph 30, page 46). The lips, functioning as a reed, in a small cup-mouthpiece can vibrate with great ease, attaining a degree of technique almost equal to that of the small keyed instruments; but as the cup grows larger,

covering more and more the player's mouth, the vibrating control becomes weaker, rendering it impossible, even for the most highly skilled performers, to obtain as high a degree of technique as that attained to for some of the keyed instruments of the corresponding pitch.

This, we hope, will suffice to place the student on the lookout so that he may never attempt to exceed the *moderate* difficulties in the parts for the large brass instruments. This rule is strictly observed in the score examples, in Parts II and III. When confined within that limit the Brass will then produce the best possible results.

72. Rapid *tremolos* on valve instruments are impracticable and, even in a moderate movement, repetition of somewhat large intervals should be avoided as much as possible. It may be accepted as a rule that, regardless of the fingering—being simple or awkward—the slurred repeated intervals are quite easy up to the major-thirds, but from the perfect-fourth upward they become more and more difficult—owing to the necessary quick changes in the lip-pressure. For example:—

(♩ = 92)

easy rather difficult difficult very difficult etc.)

Horn, Trumpet or Saxhorn

73. Major and minor trills for valve instruments are also to be used with much caution, as on some notes of the scale they are very difficult or impossible. It must also be noticed that the effect of trills on valve instruments is rather harsh, especially in the Horns and low-voiced Saxhorns. Yet there are special instrumental effects in which even the harshest trills in the Brass become very appropriate.

74. The aid of valves is out of the question for major trills in the high register; these trills—as on the slide Trombone—are executed, without valves, by rapid changes in lip-pressure (see foot-note, page 74).

75. All the trills possible on valve instruments are to be found in the next table.

EXPLANATORY NOTE

In the following table the trills indicated by whole notes are the best, resulting clear and in tune; and those indicated by quarter-notes are inferior in tune and clearness. The lip-trills, separated by brackets (|) are indicated only for the sake of completeness, they should never be used in orchestra or band parts as very few performers are found who have specialized in these and other tricky executions.

Possible Trills for the most used Valve Instruments

Horns (in F and E \flat)

Whole Tone

with valves.....

with lips.....

Half-tone

with valves.....

with lips.....

Transposing Saxhorns; Cornets and (Modern) Trumpets

Whole Tone

with valves.....

with lips.....

Half-tone

with valves.....

B \flat Tuba (Euphonium)

Whole Tone

with valves.....

with lips.....

Half-tone

with valves.....

E \flat Bass Saxhorn and E \flat Tuba

Whole Tone

with valves.....

Half-tone

with valves.....

B \flat Contrabass Saxhorn and BB \flat Tuba

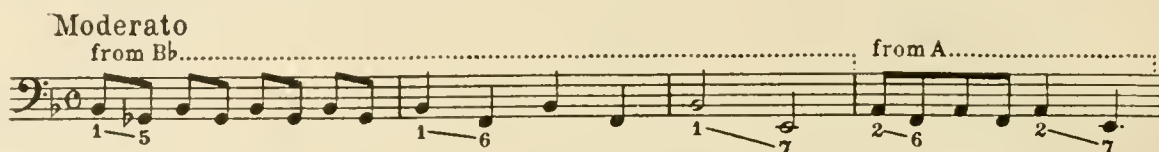
Whole Tone

with valves.....

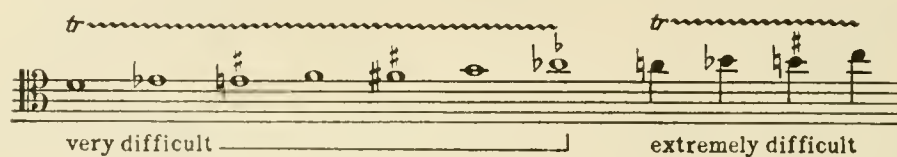
Half-tone

with valves.....

76. Repeated intervals on the slide Trombone are possible only in a very moderate movement. Intervals combined with distant positions (1st to 5th, 6th or 7th; 2nd to 6th or 7th, etc.) are very difficult and they can be used only in very slow passages, e.g.:—

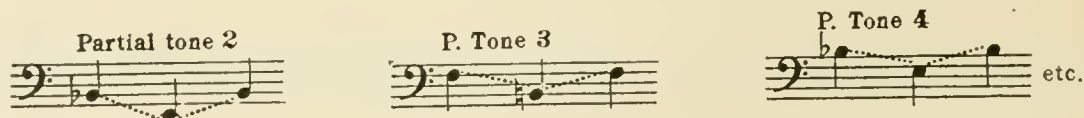


77. Trills are impracticable on the slide Trombone, with the exception of the following major (whole tone) lip-trills:—



but their use in scoring is not advisable as they can be performed only by very few players.¹

78. The Trombone's *glissando*, occasionally used in burlesque- or in dance-music, can be produced only on certain groups of notes which pertain to the partial tones of the same number in the seven harmonic series of the instrument, i. e., the longest *glissando* can be played on each group of seven notes that run straight from position 1 to 7 or vice-versa (see page 67), thus using the entire length of the slide:—



The *glissandi* may be curtailed to six, five, four, three, or two notes as required, by using only a portion of the slide. While *glissandi* are easy to execute on partial tones of the same number, they are impossible on groups of notes pertaining to different partial tones, for example:—



¹These lip-trills are formed with two partial tones of the same harmonic series (see page 67), and in order to execute them, the player must submit his lips to a special training, which, in most cases, is injurious to the quality and steadiness of the tone.

(d) Quality of Tone

79. The quality of tone of the cup-mouthpiece instruments may be briefly described as follows:—

HORNS:—Mellow; rich, highly penetrating and expressive when played naturally, and blasting, aggressive, when forced. Excellent, when muted, for distant or echo effects.

SAXHORNS:—Very mellow; sweet, mysterious, gloomy in *piano*; human-voice-like in *mezzo-forte* and *forte*, powerful in *fortissimo*. The high voiced Saxhorns (Bugle-shape) can also be employed with mute; the low-voiced Saxhorns are impracticable with mute (see paragraph 70).

TUBAS:—Somewhat brilliant; very sonorous, rich and of good blending quality with the other wind instruments. Impracticable with mute. (see paragraph 70).

TRUMPETS and TROMBONES:—Brilliant; penetrating and of great carrying power; noble in *piano*; pompous in *forte* and strident in *fortissimo*. The mute can be employed effectively on both the Trumpet and Trombone.

80. The foregoing descriptions of the quality of tone of the Brass refer to each of the various families taken in its entirety. The single instruments employed separately, or associated with other groups, according to the situation (harmonic, rhythmical or dynamical), with their timbre will produce new tonal tints, express new feelings or impart more vitality to the ensemble.

This and other knowledge in the possibilities of wind instruments, the student will acquire through that greatest of all teachers, viz.: "EXPERIENCE"—practical experience in *score-reading*, *instrumentation* and *conducting*.

ILLUSTRATIONS OF THE MODERN BRASS INSTRUMENTS

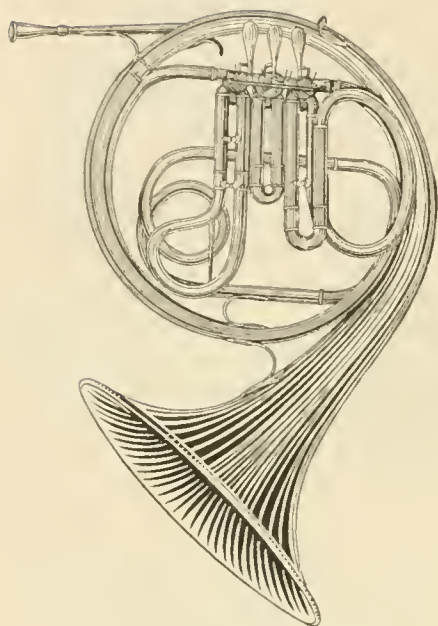
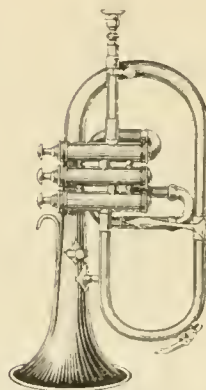
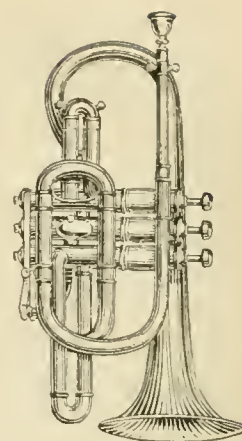


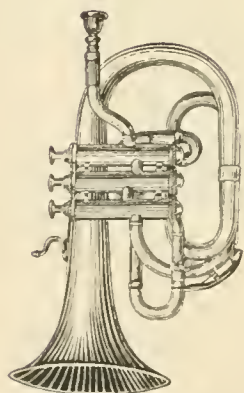
Fig. 19—HORN in F or E \flat



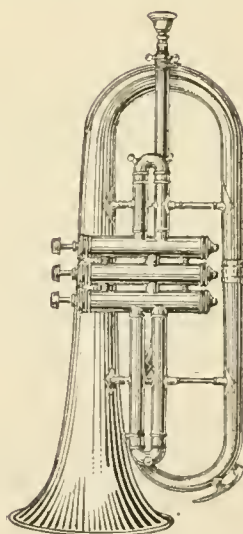
*Fig. 20—SOPRANINO
SAXHORN in E \flat*



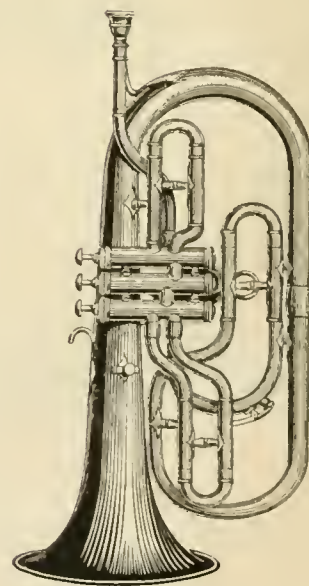
*Fig. 21—SOPRANO
SAXHORN in B \flat or A
(Cornet Model)*



*Fig. 22—SOPRANO
SAXHORN in B \flat
(Bugle Model)*



*Fig. 23—MEZZO-SOPRANO
SAXHORN in B \flat*



*Fig. 24—ALTO
SAXHORN in E \flat*

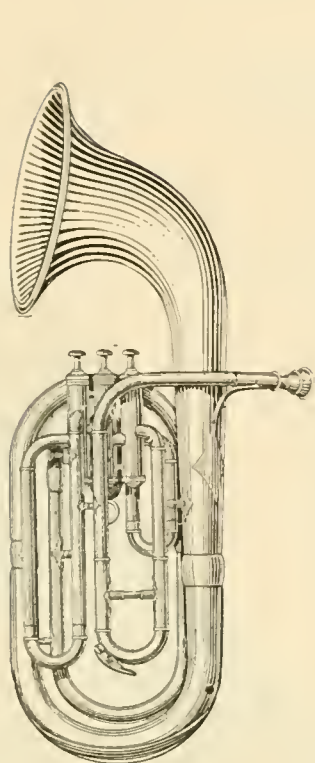
ILLUSTRATIONS OF THE MODERN BRASS (*continued*)

Fig. 25
TENOR
SAXHORN
in B \flat

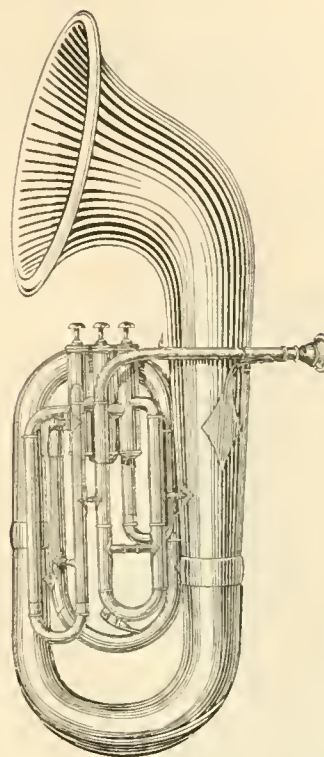


Fig. 26
BARITONE
SAXHORN
in B \flat

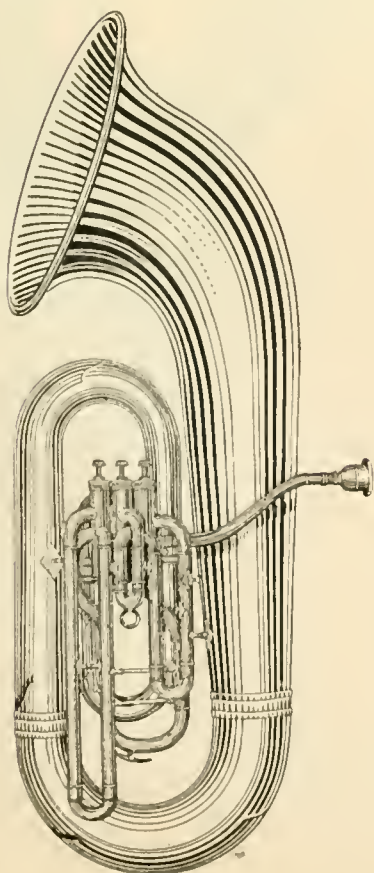


Fig. 27
BASS
SAXHORN
in E \flat
(Upright Model)

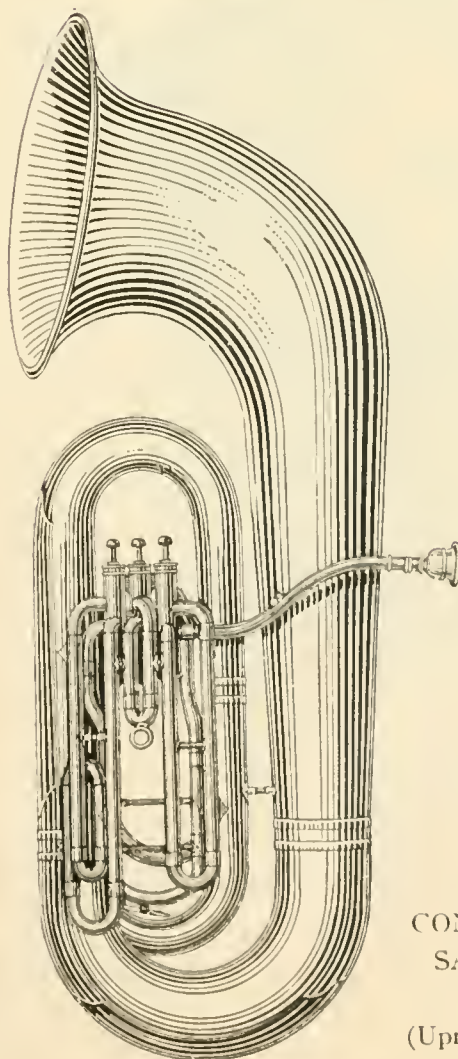


Fig. 28
CONTRABASS
SAXHORN
in B \flat
(Upright Model)

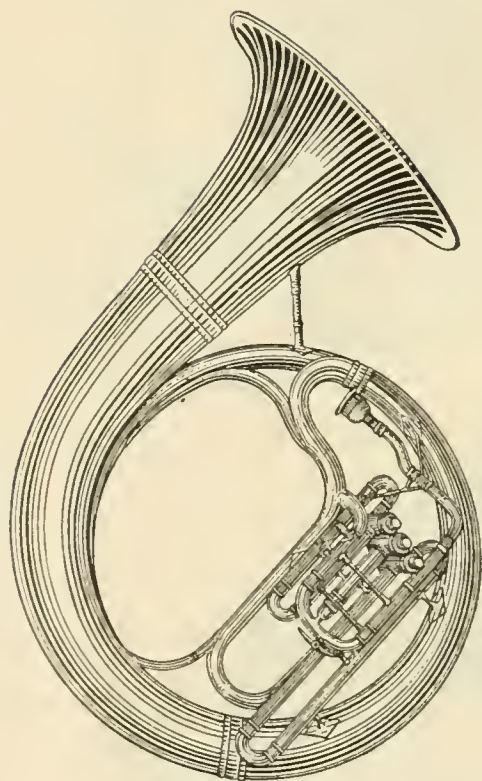
ILLUSTRATIONS OF THE MODERN BRASS (*continued*)

Fig. 29—BASS SAXHORN in E \flat
(Circular Model)

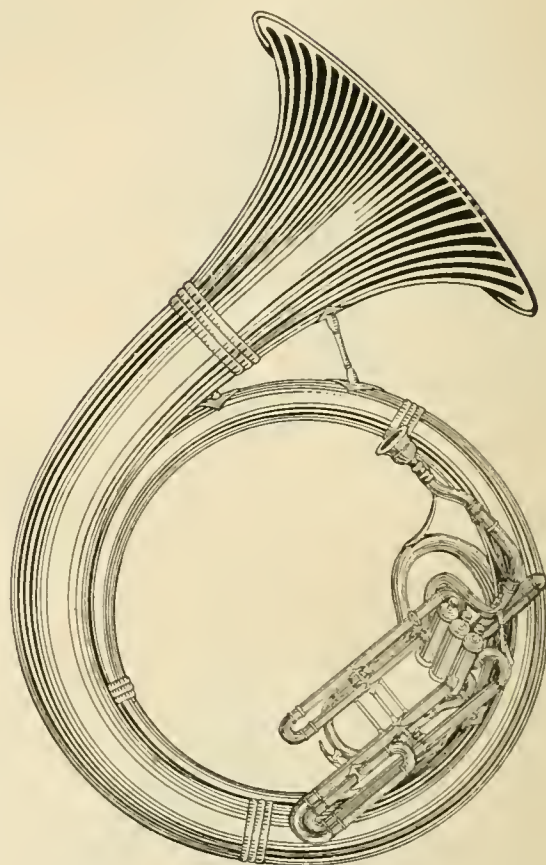


Fig. 30—CONTRABASS SAXHORN in B \flat
(Circular Model)

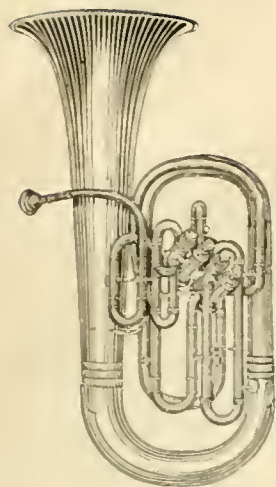
ILLUSTRATIONS OF THE MODERN BRASS (*continued*)

Fig. 31
ALTO TUBA in E \flat

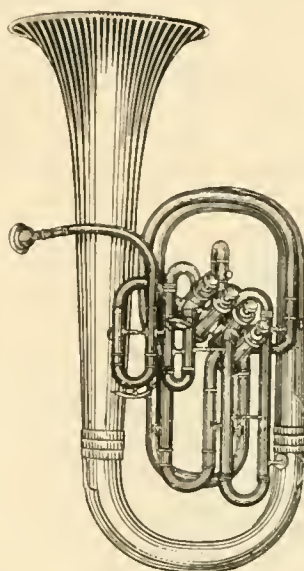


Fig. 32
TENOR TUBA in B \flat

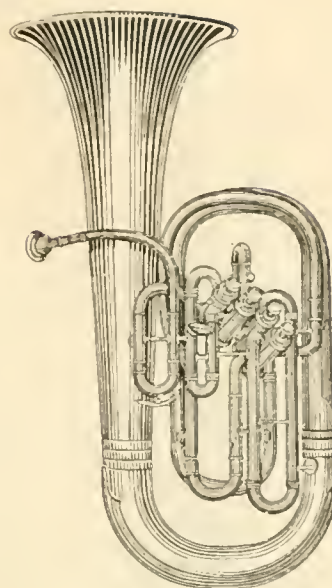


Fig. 33—BARITONE TUBA in B \flat
abbreviated "B \flat -Tuba," also
known as "Euphonium"

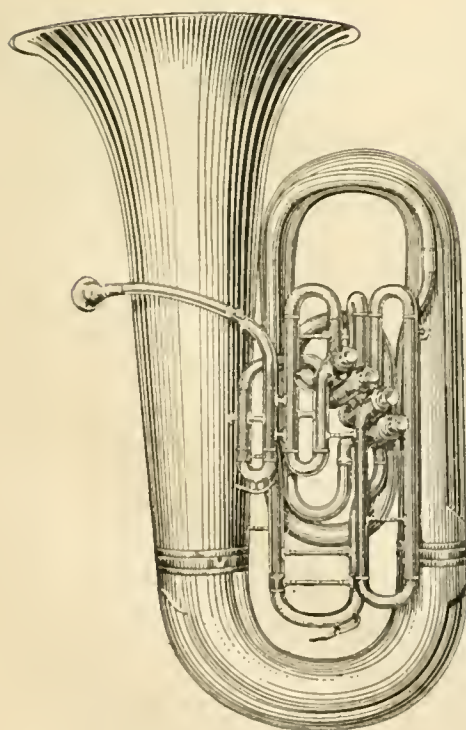


Fig. 34—BASS TUBA¹ in F or E \flat
abbreviated "F- or E \flat -Tuba"

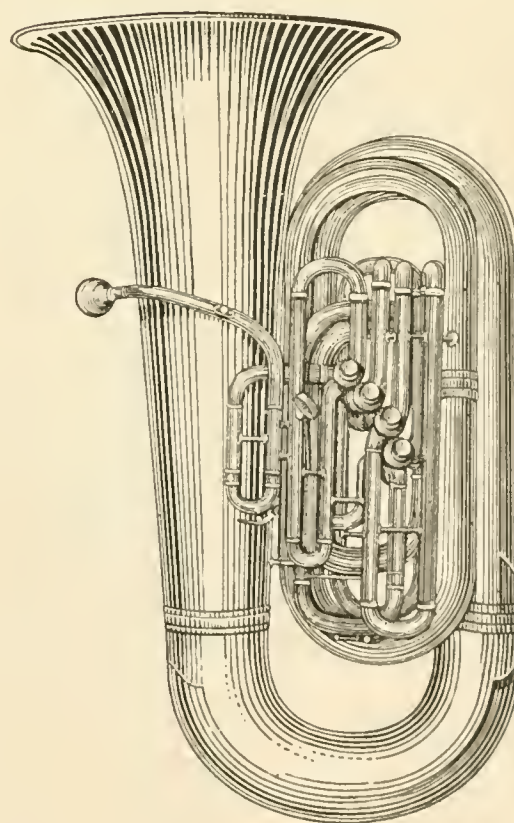
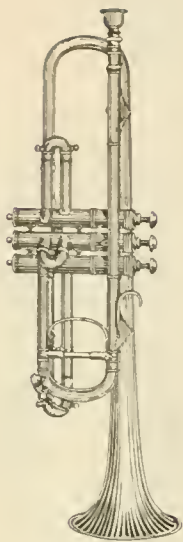
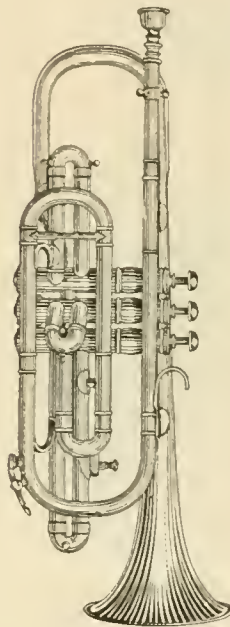
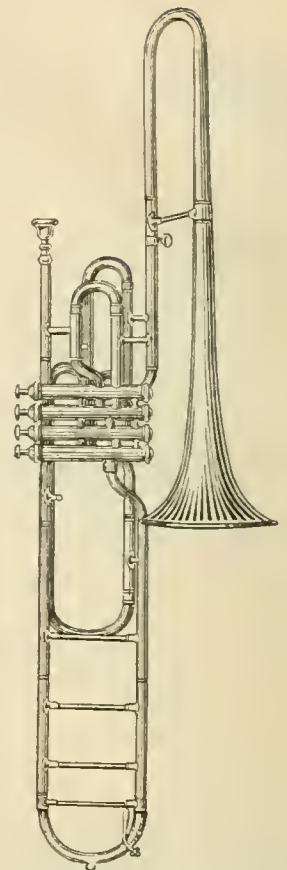
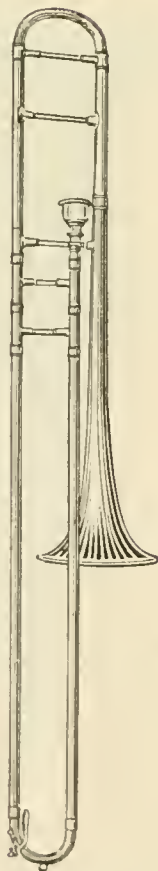
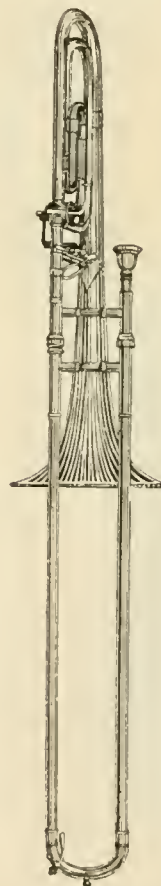


Fig. 35—CONTRABASS TUBA¹ in C or B \flat
abbreviated "CC- or BB \flat -Tuba"

¹Bass and Contrabass Tubas are also made in circular model, but the upright ones are much more preferable and are in general use.

ILLUSTRATIONS OF THE MODERN BRASS (*continued*)*Fig. 36*—TRUMPET in B \flat or A*Fig. 37*—TRUMPET in E \flat *Fig. 38*—VALVE TROMBONE
(Tenor)*Fig. 39*—TROMBONE
(Tenor in B \flat)*Fig. 40*—BASS-TROMBONE
(in B \flat with F-valve)

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ERRATA

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14—Foot-note No. 1: Read Die Pilgrimme for Die Pilgrim.

26—Timpani: Read Medium for Middle.

29—Put 8^{va} over the high limit of the Harp compass.

34-35—Under **G2**, add **G3**. After Trumpets **I. II.** add **III.** Put bass-clef to the compass of the Tenor Trombones. Put 8^{va} over the high limit of the Harp compass. For the Symphony Band of 75, change to **3** Trumpets and **1** Harp.

62—Foot-note No. 4: Read Ring des Nibelungen.

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